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hitherto Extant.

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RULES.

AS ALSO

*FR*ACTIONS Vulgar and Decimal,
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With Considerable Additions, and curious Improvements, by the Author,

GEO. FISHER, Accomptant.

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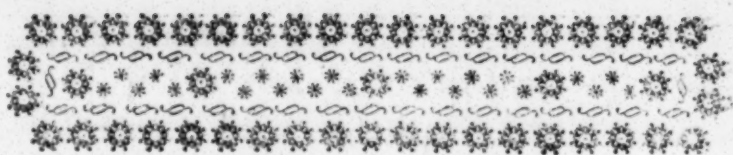
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To the Right Worshipful

Sir Samuel Clarke, Kn^t.

And Merch^t of the Honourable

CITY of LONDON.

S I R,

*****HEN I considered of your
* W * great Abilities, and most
* * consummate Knowledge, in
***** Things of this Nature, I was
under great Hesitations, lest I should
appear too presumptuous in dedicating
such a Trifle to your Worship: But
then, Sir, again considering, that your
Candour, and obliging Condescension,
was equally as great; and also encour-
aged by Favours formerly received, I
have ventured to shelter this *Treatise*
of Arithmetick, under your great Name;

A 2.

and

DEDICATION.

if it gain but your Approbation I shall not be ambitious of any other *Impri-matur*; but acquiesce with some Assurance, that the Book will meet with a favourable and kind Reception in the World. In this Impression I have endeavoured to be as correct as possible, and have made large *Additions* and *Improvements* in the several *Rules*, which, with all humble Submission, encourages me to hope may in Part excuse for my tenth Presumption in troubling your Worship: and remain, with all possible Respect and Deference,

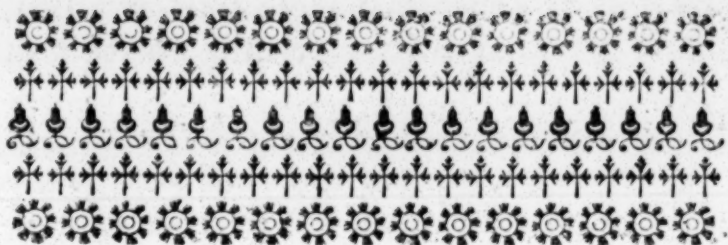
Your Worship's,

most Devoted,

and most Obedient

humble Servant,

GEO. FISHER.



T H E P R E F A C E.



Sometime before I attempted, or had any Thoughts of compiling this Book, a very good Friend of mine, (*Mr. Wilkins, Russia Merchant*) desired me to draw him out some few Notes of the shortest Ways and Methods of working some of the Rules in *Arithmetick*; which when I set about, endeavouring to oblige my Friend, I hit on several Things, (not thought on by me before) which I hoped, if made publick, might be of good Service to the World.

If it be objected, That the Books on this Subject are too numerous already, I answer, That as many as there are extant, yet there are none so perfect, but there may be Improvements made upon them; and if so, and that these Improvements

The P R E F A C E.

may be of any considerable Use and Benefit to Mankind, why may they not be made publick?

Arithmetick (saith Mr. *Locke*, in his *Essay on human Understanding*) is of such general Use and Service, in all the Parts of Life and Business, that scarce any thing is to be done without it; and therefore I think there cannot be too many, or too good Instructions for its Attainment: And before either *Hodder's*, *Cocker's*, or *Ayre's* Books appeared in the World, there were many excellent Pieces of that Science then extant; and yet their Books came abroad, and found encouraging Entertainment, and they themselves Applause for their Endeavours.

And if another improves as much upon them, as they did upon others before them, why may he not hope for some Success and Approbation? In short, if the Book meets with Encouragement but equal to the Author's Care and Endeavours, to make it the most useful of its Kind, he will have Reward enough.

As to the Work, I have gone through *Numeration*, *Addition* (with several useful Tables) *Subtraction*, *Multiplication*, and *Division*, with so much Plainness and Perseverance, and in such familiar and pertinent Terms, that the meanest Capacity may understand them, and apply them properly.

The P R E F A C E.

In *Multiplication* I have been more copious than ordinary, that I might shew the excellent Uses that may be made of that Rule only, particularly in *Money*; where by having the Price of one Thing, I have shewn how to find the Value of many Things at that Rate: So that if a person well understands the Methods and Intentions of the Rules and Directions therein laid down, (which are as easy as *Addition of Money*) if he makes no farther Advances in *Arithmetick*, yet he shall be able to cast up most Things that ordinarily occur in common Business, with Elegancy and Expedition.

In *Division* I have shewn the two *Italian* Ways of Dividing; and also several *Examples*, whereby a Sum many Times may be sooner (and in much fewer Figures) worked at two Divisions than at one: Likewise how Sums of divers Denominations, as of *Pounds*, *Shillings*, and *Pence*, &c. may be divided into equal Parts, without reducing them into the lowest Name mentioned (as is generally the Practice) and is done in half the Time, and a Quatter of the Figures us'd in the other Way. Also by *Division* to find, having the Value of many Things, the Price of one thing at that Rate.

In *Reduction* I have shewn great Variety of Working, and divers Ways of abbreviating the common Method us'd in that Rule;
and

The P R E F A C E.

and how to bring *Gross Weight* into *Pounds* without multiplying.

Next I shew the shortest and best Methods of deducting *Tare* and *Tret*, &c.

In the *Rule of Three* I have been very full in explaining its Nature and Use; with two several Methods of shortening most Operations in that Rule, as is clearly evinced by fundry Examples therein.

From thence I pass to the *Rule Inverse*, and exemplify it by Variety of *Rules* and *Examples*: As also the *Double Rule of Three Direct* and *Inverse*; with the *Rule of Three*, composed of the Five given Numbers.

Then the several *Rules of Practice* are taught with greater Variety and Improvements than in any one Book of *Arithmetick* hitherto extant.

As also the *Rule of Company*, with a method of contracting the tedious Way of working Questions in that Rule.

Likewise *Interest* at all Rates, shewn in fundry *Examples* variously wrought. With *Discount*, *Exchange*, *Profit* and *Loss*.

Then I treat of *Fractions* both *Vulgar* and *Decimal*, working one with the other, in such a Method as renders both easy to be understood: And in such familiar Terms as explain their Nature and Use.

I have now with the utmost Care, Diligence and Probity, endeavoured to make this
Piece

The P R E F A C E.

Piece of *Arithmetick* the most useful of its Kind, considering its Bulk and Value) that is at present extant: Here is nothing abstruse or mysterious, but all plain and easy; and nothing but what will bear an intelligible Demonstration.

I have gone through the whole Book, Line by Line, and have taken all due Care to correct what was amiss in the other Impression; and as there was no other Hand in the Revival made use of but my own, I can with greater Assurance affirm, and with the more Confidence assert, that the Book is now entirely correct: And the *Additions* which are very numerous and considerable, (almost in every Rule) are new, short, and very concise in Operation; and pertinently interspersed thro' the whole, as I had Opportunity and, saw Occasion.

If there should by chance be a Transposition of a Letter, (tho' there hath been great Care taken of that also) or by a greater Chance, a false Figure or Cypher, or a misplaced one, I hope, nay, I doubt not, but truly judicious, and candidly ingenious Readers will excuse me for them; for tho' all may take Care, yet there's none infallible. But I can with a modest Boldness assure them, there is no Occasion for an *Errata* Page, which may discourage them at the Beginning, or cool them at the latter End of the Book.

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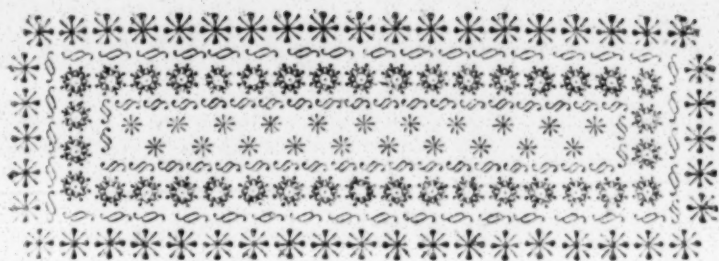
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CHAP. I.

ARITHMETICK is the Art of casting Accounts by Number, and hath these Five Parts, viz. NUMERATION, ADDITION, SUBTRACTION, MULTIPLICATION, and DIVISION, which ought thoroughly to be known and understood; for by these Rules only, the whole Art is attainable, all other being wrought by them,

of

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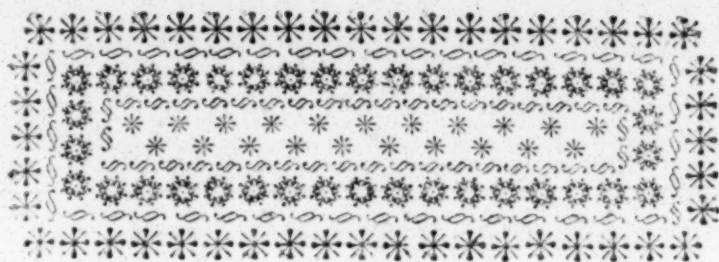
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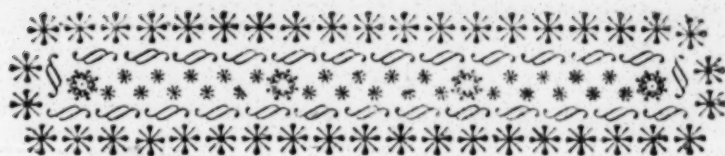
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of



OF NUMERATION.

NUMERATION teaches to read or write any Sum or Number, known or proposed.

To which End observe, that all Numbers whatsoever, are express'd by, or compos'd of, these Ten Figures or Characters, *wiz.*

One,	Two,	Three,	Four,	Five,	Six,
1	2	3	4	5	6
	Seven,	Eight,	Nine,	Cypher.	
	7	8	9	0	

The first Nine of these are called Significant Figures, to distinguish them from the 0, or Cypher, which of itself, is insignificant, and therefore, by some, is called a Nought; but it serveth to increase or decrease the Value of other Figures, according as it is placed.

Every one of the Nine Digits hath two Values; the one certain by its form; and the other uncertain by its Place.

The Value of a Figure may be said to be certain when it stands alone, without any Figure or Cypher annexed to it, Or, if it stands in the first Place or Place of Units, in a Number; for then it never signifies any more than its own Value; as 2 is but Two, 6 but Six.

The Value of a Figure may be said to be uncertain with respect to the Place it is found in: So any of the Nine Figures in the Place of Units, signifies but its simple Value, (as was said before) but in the second Place it is to be accounted so many Tens, as it contains Units. As 5, in the first Place, is but Five; but in the second Place it signifies so many Tens or Fifty. So that 5 may signify Five, or Fifty, or five Hundred, or Five Thousand; and 7 may signify 7, or Seventy, or Seven Hundred Thousand, &c.

So

So every Figure is encreased in Value, by a tenfold Proportion, from the Right Hand to the Left. As, in the first Place, it is so many Units, or Ones; in the second Place, so many Tens; in the third Place, so many Hundreds; in the fourth, so many Thousands; in the fifth, so many Ten thousands; in the sixth, so many Hundred Thousands; in the seventh, so many Millions, &c.

Admit this Number for Explanation, viz. 1234567, the 7 is only seven Units, or Seven; but 6 in the second Place, is six times Ten, or Sixty; the 5 in the third Place, an Hundred times Five, or five Hundred; the 4 in the fourth Place, a thousand times Four, or four Thousand; the 3, three times ten Thousand, or thirty Thousand; the 2, in the sixth Place, two hundred Thousand; and 1, in the seventh Place, one Million. Thus the Order of Places is accounted from the Right Hand to the Left, but to be read from the Left Hand to the Right, thus: one Million, two Hundred, thirty-four Thousand, five Hundred, Sixty-Seven.

If any Figure hath a Cypher, or Cyphers, joined to it, it will still retain the Value of its Place, as much as if joined with any other Figure, or Figures, in the Room of the Cypher, or Cyphers. So if to the Figure 5, there be annexed a Cypher thus (50) its Value is five Tens, or Fifty; because it stands in the second Place, or Place of Tens. Or, if it have two Cyphers joined with it thus, (500) its Value is five Hundred; because it possesseth the Place of Hundreds, or third Place, &c.

For the easier understanding the foregoing Directions, and better reading any Number, observe the following *TABLE*.

B

Th

The NUMERATION TABLE.

Places.	Hundreds of Millions. Ten of Millions, Millions.	Hundreds of Thousands. Tens of Thousands. Thousands. Hundreds. Tens. Units.	Milli.	Thousf.	Unit.
	9 8 7 6 5 4 3 2 1	9 8 7 6 5 4 3 2 1	987	654	321
	9 8 7 6 5 4 3 2	9 8 7 6 5 4 3 2	98	765	432
	9 8 7 6 5 4 3	9 8 7 6 5 4 3	9	876	543
	9 8 7 6 5 4	9 8 7 6 5 4		987	654
	9 8 7 6 5	9 8 7 6 5		98	765
	9 8 7 6	9 8 7 6		9	876
	9 8 7	9 8 7			987
	9 8	9 8			98
	9	9			9

The first Thing to be done, is to get by Heart the Value of the several Places, with their Number, at the Head of the Table, *viz.* Units, Tens, Hundreds, Thousands, &c. which being well understood, the Learner may thereby be capable of reading or writing any Number proposed.

And for the easier reading of the Numbers in the Table, they are, on the Right Hand, set by Periods; and over them, the Names of Units, Thousands, and Millions, and to be read thus; 987 Millions, 654 Thousands, 321. The next Line, 98 Millions, 765 Thousands, 432. And the next, 9 Millions, 876 Thousands, 543, &c.

Though

Though this Table consists of but nine Places, yet it might have been extended to twelve, fourteen, or more Places, at Pleasure. As after hundreds of Millions, Thousands of Millions; ten Thousands of Millions, hundred Thousands of Millions; then Millions of Millions, &c.

As, admit this Number of thirteen Places, *viz.* 1234567890123; for the easier reading of which, or any other Number, make a Point under or over every third Figure, beginning at the Right Hand, thus :

1 . 234 . 567 . 890 . 123

So that the first Point is under 1, and the last under 2, towards the Left Hand; and you are to account every third Place, or Periods Hundreds, and to read it thus; 1 Million of Millions, 234 Thousands, 567 Millions, 890 Thousand, 123.

QUESTIONS.

1 What is 5 in the fifth Place?

Ans. By annexing four Cyphers on the Right Hand thus, 50000; it is fifty Thousand.

2 What is the 7 in the seventh Place?

Ans. By putting six Cyphers on the Right Hand thus, 7000000; it is seven Millions.

3 How do you set down Eleven Thousand, Eleven Hundred and Eleven?

Ans. Thus, 12111, { 11000, Eleven Thousand.
1100, Eleven Hundred.
11, Eleven.

Proved by Addition { 12111. Proof.

4 How do you write Fourteen Thousand, Fourteen Hundred and Fourteen?

Anfw. Thus. 15414, { 14000, Fourteen Thousand.
1400, Fourteen Hundred.
14, Fourteen.

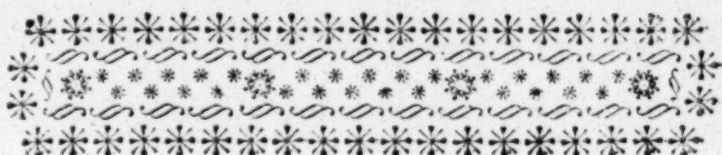
Proved by Addition, { 15414 *Proof.*

N U M B E R S.

707. Seven Hundred and Seven.
4006, Four Thousands and Six.
60606, Sixty Thousands, six Hundred and Six.
100004, One Hundred Thousand and Four.
7770405, Seven Millions, 770 Thousands 405.
500007, Five Hundred Thousands, and Seven.
111111, One Hundred Eleven Thousand, 111.
999999, A Million wanting One.
400400400, Four Hundred Millions, 400 Thous. 400.
{ Ten Thousand Times Ten Thousand.
100000000, { or, One Hundred Millions, *Revel.* v.
11.
{ Two Hundred Thousand Thousand,
200000000, { or, Two Hundred Millions, *Revel.*
ix. 16
{ Two Thousand and Seventy Millions,
2070040500, { Forty Thousand Five Hundred.

A Table of Old Roman Numbers.

100 C.	2000 CIJ. CIJ. or, M. M.
200 CC.	3000 CIJ. CIJ. CIJ. or, M. M. M.
300 CCC.	5000 IJJ.
400 CCCC.	10000 CCIJJ.
500 D or IC.	50000 IJJJJ.
600 DC.	100000 CCCIJJJ. or CM.
700 DCC.	500000 IJJJJJJ.
800 DCCC.	1000000 CCCCIIJJJJ.
900 DCCCC.	1666 MDCLXVI.
1000 M. or, CIJ.	1718 MDCCXVIII. or, CIJ.
	12CCXVIII.



C H A P. II.

OF ADDITION.

ADDITION is the putting two or more Numbers or Sums together, and thereby bringing them into one Total Sum.

And is of one Denomination, or several.

Addition of one Denomination is, when the Numbers or several Articles are all of one Name; that is, all Pounds, Gallons, Ells, Miles, Sheep, &c.

Addition of several Denominations is, when the several Lines consist of divers Names, as *Pounds, Shillings, and Pence; Hundreds, Quarters, and Pounds; or, Yards, Quarters and Nails, &c.*

Numbers to be added together, must be placed in such Order under one another, (it matters not which is uppermost, the greatest or least Numbers) that Units may stand under Units; Tens under Tens; Hundreds under Hundreds; Thousands under Thousands, &c.

As if you were to add 122 Feet, 44 Feet, and 33 Feet together, they must be set down one under the other as follows, *viz.*

<i>Feet.</i>		<i>Feet.</i>
122	Or thus	33
44		44
33		122

Having placed the Numbers to be added as above, draw a Line under them, and begin at the lowest Figure on the Right Hand, being the Place of Units, saying, 2 and 4 is 6 and 3 is 9, which put directly under the Line, and just under its own Rank, *viz.* under 2 and 4 and 3; and then go to the next Row towards the Left

B 3.

Hand,

Hand, saying, 3 and 4 is 7, and 2 is 9; which also set down under the Line, just under its own proper Rank, viz. under 3, 4, and 2; then go to the last Row, where you find but 1, which you must put down also under the Line just under itself; and so the Numbers are added together; and you will find that they make 199 Feet in all, as by the *Example* following.

<i>Hundreds.</i>	<i>Tens.</i>	<i>Units.</i>
1	2	2
	4	4
	3	3
1	9	9

<i>Hundreds.</i>	<i>Tens.</i>	<i>Units.</i>
	3	3
	4	4
1	2	2
1	9	9

1 9 9 Feet in all.

When any of the Ranks amount to Ten or Tens, or they exceed Ten or Tens, then you must place a Cypher under the Line in its proper Place; or else, what is above Ten, or Tens; and for every Ten carry an Unit, or One, to be added to the next Rank. *As for Example:* If the Series or Row, amount just to Ten, I set down a Cypher under the Line in its Place, (for every Figure or Cypher must be sure to stand just under its own Rank) and carry one to the next Rank for the one Ten. So if any of the Rows come just to even Tens, as 20, 30, 40, &c. I set down a Cypher, and carry either two, three, or four, according to the Number of Tens. And when it happens, that any of the Ranks exceed Ten, or Tens, then whatever the Excess is, set it down under the Line in its Place. As if it amounts to 45, set down 5, and carry 4, for the four Tens, to the next Row. If to 72, set down 2, and carry 7, for the seven Tens, &c. And when you come to the last Row, set down what it amounts

amounts to, let it be what it will. *Examples* follow, exemplifying the Directions above.

Add 26*l.* 15*l.* 20*l.* and 45*l.* together. Also 265 Ells, 354 Ells, 460 Ells, 375 Ells, and 246 Ells together; which must be set down as underneath.

<i>Pounds.</i>	<i>Ells.</i>
26	265
15	354
20	460
45	375
	246
106	1700

Beginning at the lowermost Figure in the Place of Units, say, 5 and 5 is 10, and 6 is 16, which is 6 over one Ten, wherefore set down 6 under its own Rank, and carry 1 for the Ten to the next Rank, saying, 1 that you carry, and 4 is 5, and 2 is 7, and 1 is 8, and 2 is 10, which being the last Row set down 10, and the Work is done; and the *Total* of the four Numbers is 106*l.* As in the *Example*.

So, in the next *Example*, begin with the bottom Figure on the Right Hand, and say, 6 and 5 is 11, and 4 is 15, and 5 is 20; which being just two Tens, and nothing over, set down a 0, and carry 2 to the next Rank, for the 2 Tens, and say, 2 that you carry, and 4 is 6, and 7 is 13, and 6 is 19, and 5 is 24, and 6 is 30; which amounting just to 3 Tens, set down a 0 again, and carry 3 for the 3 Tens, saying, 3 that you carry, and 2 is 5, and 3 is 8, and 4 is 12, and 3 is 15, and 2 is 17, which being the last Row, set down 17, and the total Sum is 1700 Ells; as may be seen in the *Example*.

The Reason for carrying One for every Ten to the Left Hand is, because the Increase of every Place that Way, is by a tenfold Proportion, as was said in *Numeration*.

Examples for Practice.

<i>Yards.</i>		<i>Gallons.</i>	<i>Pounds.</i>
74	Or thus	74	746
09		9	379
72		72	024
19		19	100
07		7	074
70		70	047
251		251	1370

Some choose to omit the Cyphers on the Left Hand, as in the second *Example*; thinking it a little too precise, since Cyphers on the Left Hand signify nothing; but the other is best for a Learner, for his better understanding the Value of the Places, &c.

More Examples.

<i>l.</i>	<i>Ells.</i>	<i>l.</i>
71	742	7444
17	371	270
46	460	5000
64	072	500
20	971	6742
2	674	240
56	324	52
65	05	9
341	3626	20257

Here follow some familiar *Examples*, shewing the Nature and Use of this Rule, viz.

Question

Question 1. Between *London* and *Roxton* are 33 miles from thence to *Cambridge* 10; thence to *New-market* 10; thence to *Bury* 10; thence to *Thetford* 10; thence to *Attleborough* 10; and from thence to *Norwich* 12 Miles: How many Miles are there between *London* and *Norwich*?

Miles.

Set down the Numbers thus. $\left\{ \begin{array}{l} 33 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 12 \end{array} \right.$

Between *London* and *Norwich* are 95 Miles.

Question 2. Again, how many Days are there in these 12 Calendar Months, or a Year?

Days.

January hath	—	—	—	31
February	—	—	—	28
March	—	—	—	31
April	—	—	—	30
May	—	—	—	31
June	—	—	—	30
July	—	—	—	31
August	—	—	—	31
September	—	—	—	30
October	—	—	—	31
November	—	—	—	30
December	—	—	—	31

Answer, 365 Days.

Question. 3. Suppose a Farm contains these Acres in the several Fields following, viz,

B 5

In

	<i>Acres.</i>			
In one Field	—	—	—	10
Another	—	—	—	15
Another	—	—	—	12
Another	—	—	—	20
Another	—	—	—	9
Another	—	—	—	6
And in another	—	—	—	22

How many Acres in all? 94 Answer.

Question 4. Admit a *Draper* measures 10 Pieces of Cloth, and their Contents are, *viz.*

<i>N^o.</i>	<i>Yards.</i>			
1 <i>qt.</i>	—	—	—	35
2	—	—	—	1
3	—	—	—	25
4	—	—	—	10
5	—	—	—	9
6	—	—	—	16
7	—	—	—	10
8	—	—	—	20
9	—	—	—	15
10	—	—	—	8

How many Yards in all?

Answer, 160 Yards

Note, That in setting down the Numbers, Care must be taken, to place Units under the Place of Tens, but to put them properly, as in the 5th and last Article of the Sum above.

Question

Question 5. A Corn Factor bought as follows, viz.

	grs.
Wheat — — — —	56
Oats — — — —	45
Peas — — — —	24
Rye — — — —	72
Barley — — — —	220

417 Quarters in all.

Question 6. A Ship from the Indies, whose Cargo is as follows, viz.

	l.
Pepper — — — —	1;280
Other Spices — — — —	9741
Diamonds — — — —	112579
Callicoes — — — —	47217
Muslins — — — —	74219
Drugs — — — —	11241

What is the Value of the whole? l. 269277 Answer.

Question 7. What Number is that, from which, if you subtract 18, the Remainder will be 24?

Ans. 42. For if you add 18 and 24 together, they make 42, the Number sought.

To prove ADDITION.

Begin at the Top, and cast it downwards, in the same Manner as you did upwards; and if the Figures, or Cyphers of the Total, prove the same as in casting upwards, the Work is right; otherwise they must be cast upwards and downwards, till they do agree.

ADDITION of MONEY.

In *Addition* of several Denominations must be observed, how many of the smaller Name make one of the next greater: As how many *Farthings* make a *Penny*; how many *Pence* a *Shilling*; and how many *Shillings* a *Pound*. Therefore I shall place the several *Tables* of *Money*, *Weight*, *Measure*, &c. before the *Examples*, they being necessary to be first known.

Note, 4 *Farthings* make one *Penny*, 12 *Pence* one *Shilling*, and 20 *Shillings* one *Pound*.

In a *Pound Sterling*, are $\left\{ \begin{array}{l} 20 \text{ Shillings.} \\ 240 \text{ Pence.} \\ 960 \text{ Farthings.} \end{array} \right.$

Note also, That in *Addition* of *English Money*, *l.* stands for *Pounds*; *s.* for *Shillings*; *d.* for *Pence*; *qr.* for *Farthings*; because *Libra* signifies a *Pound*; *Solidus* a *Shilling*; *Denarius* a *Penny*; and *Quadrans* a *Farthing*.

But the best Way to set down *Farthings*, or Parts of a *Penny*, is :

$\left\{ \begin{array}{l} \frac{1}{4} \text{ A Farthing, or Quarter of a Penny.} \\ \frac{1}{2} \text{ A Half-penny, Half a Penny.} \\ \frac{3}{4} \text{ Three Farthings, Three Quarters of a Penny.} \end{array} \right.$

Example 1.

Suppose I owe one Person, 5*l.* 4*s.* 6*d.* to another, 7. 11. 9. to another, 4. 07. 5. to another, 7. 08. 4. to another, 8. 00. 0. and to another, 9 07. 6. How much do I owe in all to these several Persons? To do this, these several Sums must be set down in such Order, that *Pounds* may stand under *Pounds*, *Shillings* under *Shillings*, and *Pence* under *Pence*; with Points, or Strokes of Separation between them, as follows.

In

<i>l.</i>	<i>s.</i>	<i>d.</i>
5	04	6
7	11	9
4	07	5
7	08	4
8	00	0
9	07	6

In casting up this and all other Sums in this Rule, you must remember, That for every 4 in the *Farthings*, you must carry 1 to the Pence, because 4 *Farthings* make a Penny; for every 12 in the Pence, you must carry 1 to the Shillings, because 12 Pence make a Shilling; and for every 20 in the Shillings, you must carry 1 to the Pounds, because 20 Shillings make a Pound; and the Pounds must be cast up as Sums of one Denomination, for every 10, carrying one to the next Row. And in all Additions, whether of *Money*, *Weight*, or *Measure*, &c that Denomination towards the Left Hand (which is the first setting down, but the last in casting up) must be so cast up.

The same being again set down with a Line drawn under it, appears thus:

<i>l.</i>	<i>s.</i>	<i>d.</i>
5	04	6
7	11	9
4	07	5
7	08	4
8	00	0
9	07	6
41	19	6

I begin at the smallest Denomination towards the Right Hand, (as in all *Additions* we must, whether of *Money*, *Weight*, or *Measure*) to wit, *Pence*, and say, 6 and 4 is 10, and 5 is 15, and 9 is 24, and 6 is 30, now 30 Pence is 2 Shillings and 6 Pence, wherefore I put down the 6 Pence under its own Rank, and carry 2 for the two Shillings

Shillings to the Rank of Shillings, saying, 2 that I carry, and 7 is 9, and 8 is 17, and 7 is 24, and 11 is 35, and 4 is 39: Now, 39 Shillings is 1 Pound 19 Shillings; wherefore I set down the 19s. under its own Rank, and carry the 1 Pound to the Pounds, saying, 1 that I carry, and 9 is 10, and 8 is 18, and 7 is 25, and 4 is 29, and 7 is 36, and 5 is 41; which being placed under the title of Pounds, is forty-one Pounds; so the whole Sum is, 41*l.* 19*s.* 6*d.* as in the *Example* may be seen.

Addition of several Denominations, is proved in the same manner as *Addition of One*, by casting it downwards; and if it agrees with the Sum when cast upwards, it is right.

There is another Way used in Schools; that is to cast up all again, except the upper Line, and then that Total they add to the upper Line, and if it agree with the Sum first found, it is right. But this Way is not so practical in Matters of real Business; therefore I prefer the other before it.

For the readier Dispatch in casting up the Pence, 'tis very necessary to have the following Tables by heart.

Pence.	s.	d.	Shil.	Pence.
20	1	8	1	12
30	2	6	2	24
40	3	4	3	36
50	4	2	4	48
60	5	0	5	60
70	5	10	6	72
80	6	8	7	84
90	7	6	8	96
100	8	4	9	108
110	9	2	10	120
120	10	0	12	144

Get these Tables by heart, thus; 20*d.* is 1*s.* 8*d.*
30*d.* is 2*s.* 6*d.* &c.

Example

Example 2.

Bought by a Country Shop-keeper in London, viz.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
<i>Linnen Cloth</i> , to the Value of ———	21	11	4
<i>Sugars</i> , ——— ——— ———	7	10	0
<i>Tobacco's</i> ——— ——— ———	16	14	2
<i>Woollen Cloths, and Stuffs</i> , ——— ———	37	10	0
<i>Fruit</i> , ——— ——— ———	11	16	8
<i>Brandy, and Waters</i> , ——— ——— ———	9	14	2
	104	16	4

How much did he lay out in all ?

Beginning at the Pence, I say, 2 and 8 is 10, and 2 is 12, and 4 is 16; and 16d is 1s. 4d. I set down the 4, and carry the Shilling to the next, the Place of Shillings, saying, 1 that I carry, and 4 is 5, (for I omit the tens of Shillings till I come to the Top) and 6 is 11, and 4 is 15, and 1 is 16; then I come downwards with the Tens, saying, 16 and 10 is 26, and 10 is 36, and 10 is 46, and 10 is 56, and 10 is 66, and 10 is 76 Shillings, which is 3*l.* 16*s.* I set down the 16 under the Place of Shillings, and carry the 3 Pounds to the Pounds, saying, 3 and 9 is 12, and 1 is 13, (for I go up but with one Row at a time) and 7 is 20, and 6 is 26, and 7 is 33, and 1 is 34; I set down 4, and carry 3 for the 3 Tens (for the last Denomination must be cast up as Sums of one Denomination, for every 10 carrying 1, as was said before) and say, 3 that I carry, and 1 is 4, and 3 is 7, and 1 is 8, and 2 is 10; which being the last Row, I set it down. So the whole Sum is, 104*l.* 16*s.* 4*d.* as per the Work.

Example

Example 3.

A Merchant upon the ballancing of his Books, finds he has in Money, Debts, and Goods, viz.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
In Cash, —	2000	00	0
In Cambricks, — — — —	060	00	0
In Tobacco's — — — —	47	16	6
By Henry Harper, owing, — — — —	121	17	4
In Sugar, — — — —	246	07	2
In Serges, — — — —	70	11	0
By Voyage to Lisbon, — — — —	724	06	7
In Indigo, — — — —	370	12	0
By William Waxham, — — — —	1000	00	0
In Cochineal, — — — —	424	16	0
By the Ship Rose, — — — —	640	11	8
In Canary Wine, — — — —	142	17	0
	5849	15	3

Example 4.

A Brewer's Clerk receives of several Persons as follows, viz,

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Lawrence Lick Spiggot, — — — —	12	14	4
Frank Froth, — — — —	9	10	6
Sam. Savigg, — — — —	20	11	0
Ben. Bumper, — — — —	36	16	8
Henry Here'st'ye, — — — —	24	00	0
Stephen Stout, — — — —	8	16	6
Receiv'd in all,	112	09	0

Example

Example 5.

A Collector of Excise receives in

				<i>l.</i>	<i>s.</i>	<i>d.</i>
<i>Suffex,</i>	—	—	—	1420	10	6
<i>Kent,</i>	—	—	—	0974	11	2
<i>Surry,</i>	—	—	—	0641	17	4
<i>Hampshire,</i>	—	—	—	1344	11	1
<i>Hertfordshire</i>	—	—	—	0741	17	4
<i>Bucks,</i>	—	—	—	0617	10	0
Total,				5740	17	5

Example 6.

				<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>
Sold by a <i>Hosier,</i>							
4 <i>pr.</i> Silk Stockings, at	—	—	—	2	10	6	$\frac{1}{2}$
7 <i>pr.</i> Worsted ditto, at	—	—	—	1	15	2	$\frac{1}{4}$
9 <i>pr.</i> of Thread Hose, at	—	—	—	0	18	3	$\frac{3}{4}$
12 <i>pr.</i> of Children's, at	—	—	—	2	07	6	$\frac{1}{2}$
3 <i>Yds.</i> of Flannel, at	—	—	—	0	02	7	$\frac{1}{4}$
6 <i>pr.</i> of mill'd Hose, at	—	—	—	1	06	5	$\frac{3}{4}$
In all,				8	18	8	

Here I begin with the Farthings, saying, 3 and 1 is 4, and 2 is 6, and 3 is 9, and 1 is 10, and 2 is 12, which is Three-pence, which I carry to the Pence &c.

Sometimes Sums are expressed one Way, and set down another, viz.

Example

Example 7.

<i>Express'd</i>		<i>Set down</i>		
		<i>l.</i>	<i>s.</i>	<i>d.</i>
For	{ Coals, Six and Thirty Shillings, —	1	16	0
	{ Cloth, Seven and Fifty Shillings —	2	7	0
		<i>Sum,</i>	4	13 0

Example 8.

		<i>l.</i>	<i>s.</i>	<i>d.</i>
A Guinea,	—	1	01	0
A Merk,	—	0	13	4
An Angel,	—	0	10	0
A Noble,	—	0	06	8
A Crown,	—	0	05	0
A Half-Crown,	—	0	02	6
<i>Total,</i>		2	18	6

Example 9.

<i>Express'd</i>		<i>Set down</i>		
		<i>s.</i>	<i>d.</i>	<i>q.</i>
Mutton, Eight Groats, —	—	2	8	
Onions, Seven Farthings, —	—	0	1	$\frac{1}{4}$
Tobacco, Two and Twenty pence, —	—	1	10	
Wine, Fifteen pence, —	—	1	3	
Threed, Three Half-Pence, —	—		1	$\frac{1}{2}$
Soap, Nineteen pence, —	—	1	7	
Veal, Eleven Groats, ana Two Pence, —	—	3	10	
<i>Sum,</i>		11	5	$\frac{1}{4}$

Tho'

Tho' when some of these Sums are to stand alone, and not in Order of *Pounds, Shillings, and Pence*; as in a Letter, &c. 'tis better to set them down as spoken: As 15*d.* 45*s.* &c. rather than 1*s.* 3*d.* or 2*l.* 5*s.*

Note, That in setting down your Sums, Care must be taken, that you do not set down more, or so much in the Place of a lesser Denomination, than makes one of the next greater; for 'twould be absurd to write down 181 2*s.* 15*d.* for 19*l.* 03*s.* 3*d.* Or, 15*G.* 39*q.* 29*lb.* for 16*G.* 0*q.* 1*lb.*

Some used formerly (and some of weak Heads do now) to make a *Point* or *Stop*, at every 4 in the Farthings; at every 12 in the Pence; at every 20 in the Shillings; and at every 10 in the Pounds; if they consist of several Ranks, carrying so many Ones, as they find Points or Specks in one Denomination, to the next: But this Way is both tedious and slovenly. But if your Sums are very large, you may make a Stop, at every 60, in the Pence, for 5*s.* and carry accordingly to the Shillings; and for the Units Rank in Shillings, cast them up as Sums of one Denomination for every Ten carrying One to the Tens of Shillings, and reckon them as so many Ones; and when you come to the Top, halve them, which half carry to the Pounds; but if they halve not even, set down the odd One. in the Ten's Place of Shillings, &c. Examples of which, you will find in the following Page.

Whenever there is a Necessity to *point* or *stop*, do it rather upon your Nail, or on a bit of Paper, than in your Book or Paper, where the Sum is; because in proving it, the Points very rarely happen in the same Place; and the many *Stops* may be apt to confound you, and also make the Work appear foul.

Example

Tho'

Example 7.

<i>Express'd</i>		<i>Set down</i>		
		<i>l.</i>	<i>s.</i>	<i>d.</i>
For	{ Coals, Six and Thirty Shillings, —	1	16	0
	{ Cloth, Seven and Fifty Shillings —	2	7	0
		<i>Sum,</i>	4	13 0

Example 8.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
A Guinea, —	1	01	0
A Merk, —	0	13	4
An Angel, —	0	10	0
A Noble, —	0	06	8
A Crown, —	0	05	0
A Half-Crown, —	0	02	6
Total,	2	18	6

Example 9.

<i>Express'd</i>		<i>Set down</i>		
		<i>s.</i>	<i>d.</i>	<i>q.</i>
Mutton, Eight Groats, —	—	2	8	
Onions, Seven Farthings, —	—	0	1	$\frac{1}{4}$
Tobacco, Two and Twenty pence, —	—	1	10	
Wine, Fifteen pence, —	—	1	3	
Threed, Three Half-Pence, —	—		1	$\frac{1}{2}$
Soap, Nineteen pence, —	—	1	7	
Veal, Eleven Groats, ana Two Pence, —	—	3	10	
		<i>Sum,</i>	11	5 $\frac{1}{4}$

Tho'

Tho' when some of these Sums are to stand alone, and not in Order of *Pounds, Shillings, and Pence*; as in a Letter, &c. 'tis better to set them down as spoken: As 15*d.* 45*s.* &c. rather than 1*s.* 3*d.* or 2*l.* 5*s.*

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Example

Tho'

Example 10.

<i>l.</i>	<i>s.</i>	<i>d.</i>
46	17*	10
17	11	6,
74	06	09
54	19	7
45	09	8
72	14	5
27	04	3
16	07*	9
61	17	8
24	06	7,
42	17	5
24	19	7
47	11	5
74	01	9
41	00	7
36	17	5
47	17	9
20	10	11

777 12 10

Example 11.

<i>l.</i>	<i>s.</i>	<i>d.</i>
714	19	6
412	10	7
374	11	9
241	14	5
474	16	4
372	12	6
330	12	9
200	07*	9,
472	12	7
521	09	6
245	17	8
324	12	2
725	15	4
317	13	9
972	14	5
321	15	7
733	17	3
245	11	1

8004 04 11

Here, in the 10th *Example*, I begin at the Bottom, saying thus, 11 and 9 is 20 &c. till I come to the Article 24*l.* 6*s.* 7*d.* where the Figures amount to 65, there I make a *Point* or *Stop*, for 5*s.* and carry 5 to the next Figure over it, saying, 5 and 8 is 13, &c. till I come to the Article 47*l.* 11*s.* 6*d.* where it amounts to just 60; and there I make another *Point* for 5*s.* more; and for the odd 10*d.* I set it down in its Place, and carry the two 5*s.* making 10, to the Shillings, saying, 10 and 7 is 17, and 7 is 24, &c. till I come to the Top, there it amounts to 102; wherefore I set down 2, and carry 10 to the Tens of *Shillings*; saying, 10 and 1 is 11, &c.

And

And at the Top it comes to 21, the Half of which is 10, and 1 over, which I place on the Left Hand of the 2, and it makes 12s. and I carry the 10 to the Pounds, saying, 10 and 7 is 17, and 6 is 23, &c. casting the Pounds up as Sums of one Denomination; and the Total is 777*l.* 12*s.* 10*d.* As in the Example may be seen.

Or the *Shillings* may be cast up by *Pointing* at every 60, and 40, in the Unit Rank of *Shillings*, which make 5*l.* As at the Articles, *l.* 16 07 9* and *l.* 16-17 10* or uppermost Number, where a small *Asterism* is placed to denote it accordingly. At the Top it comes to 42: I set down 2, and carry 5*l.* to the Tens of *Shillings*, taking two of them as I go up, for 1*l.* saying, 5 I carry and 1 is 6, and is 7, &c.

AVOIRDUPOIS-WEIGHT.

By this Weight is weighed all Kind of *Grocery* Wares; or Goods subject to Waste; as *Tobacco*, *Sugar*, *Fruit*, *Drugs*, *Butter*, *Cheese*, *Allum*, *Iron*, *Brass*, *Lead*, *Soap*, *Tallow*, *Pitch*, *Rozin*, *Tin*, *Salt*, *Wax*, *Flax*, *Hemp*, and all kind of Garble Goods. &c.

A Table of Avoirdupois Weight.

16 Drams	}	make	1 Ounce	oz.
16 Ounces			1 Pound	lb.
28 Pounds			1 Quarter of	qr.
4 Quarters	}		a Hundred	
20 Hundred			1 Hundred	C.
			1 Tun.	T.

Note, A Pound Avoirdupois Weight is equal to 14 Ounces, 12 Penny Weight Troy.

In

In a Tun
Weight, are, { 573440 *Drams.*
 { 35840 *Ounces.*
 { 2240 *Pounds.*
 { 80 *Quarters.*
 { 20 *Hundreds weight of 112 lb. each.*

AVOIRDUPOIS *Great Weight.*

Examples.

(10)	(20)	(4)	(28)
<i>Tuns</i>	<i>C.</i>	<i>qr.</i>	<i>lb.</i>
7	14	3	12
5	19	1	06
9	07	1	00
7	07	2	12
2	15	0	20
9	17	3	21
43	02	0	15

(10)	(20)	(4)	(28)
<i>Tuns</i>	<i>C.</i>	<i>qr.</i>	<i>lb.</i>
7	11	1	12
6	07	2	15
7	09	1	17
4	15	1	16
6	07	1	14
2	17	0	19
35	08	1	9

Here you must begin at the least Denomination towards the Right Hand (as before in Money) *viz.* Pounds; saying, 21 and 10 is 31, (taking but one 10 in the 20, for the easier reckoning) which is 3 above 28; make a *Point* on your Nail for the Quarter, and say, 3 and 10 that was left in the 20, is 13, and 12 is 25, and 6 is 31; make another *Point*, and say, 3 and 12 is 15, which set down under its own Rank; and for the 2 *Points* or *Stops*, made for the Quarters, carry 2 to the Quarters, saying, 2 and 3 is 5, and 2 is 7, and 1 is 8, and 1 is 9, and 3 is 12: Now 12 Quarters is is just 3 *C.* wherefore set down 0, and carry 3 to the Hundreds; and proceed

proceed as in *Money*, (20 *G.* making a *Tun*, as 20s. did a Pound) saying, 3 and 7 is 10, and 5 is 15, and 7 is 22, and 7 is 29, and 9 is 38, and 4 is 42, and coming down with the Tens, say, and 10 is 52, and 10 is 62, and 10 is 72, and 10 is 82, which is four *Tuns*, and 2*G.* over; which I set down, and carry 4 to the *Tuns*, saying, 4 and 9 is 13, and 2 is 15, and 7 is 22, and 9 is 31, and 5 is 36, and 7 is 43; and so the Sum is finished, the Total being 43 *Tuns*, 02*G.* 0 *qr.* and 15 *lb.* As in the *Example* may be seen.

The Figures over the Titles of each respective Denomination, shew what you must stop or point at, and are distinguished thus: (10)(20)(4) and 28).

More Examples for Practice.

(10)	(20)	(4)	(28)
<i>Tuns.</i>	<i>G.</i>	<i>qr.</i>	<i>lb.</i>
74	13	0	15
46	11	1	17
44	09	2	06
74	19	3	16
44	07	0	21
74	14	1	15
359	15	2	06

(10)	(20)	(4)	(28)
<i>Tuns.</i>	<i>G.</i>	<i>qr.</i>	<i>lb.</i>
74	14	1	16
41	06	1	11
24	15	2	07
19	06	3	15
26	14	1	07
14	12	2	15
201	10	0	5

Twelve Hogheads of Tobacco, containing, *viz.*

No.	C.	qr.	lb.
1	7	3	12
2	4	1	17
3	9	0	24
4	6	3	26
5	5	1	17
6	4	2	20
	38	2	04

No.	C.	qr.	lb.	Tare
7	5	1	24	90
8	4	2	19	94
9	4	3	23	99
10	3	3	21	84
11	4	1	23	79
12	4	3	24	96
	28	1	22	542

C.	qr.	lb.
71	1	19
47	3	24
57	2	16
71	0	21
47	1	12
51	2	06
347	0	14

C.	qr.	lb.
46	1	19
24	3	03
23	0	21
67	2	13
27	1	17
34	3	23
224	2	12

Avoirdupois Small Weight.

This is in use chiefly for *Silk*; as among *Stocking-makers, Weavers, &c.* they deliver their *Silk*, out and in, by *Pounds, Ounces, and Drams*.

Example

Examples.

Tare

90

94

99

84

79

96

42

(16)(16)			(16)(16)		
lb.	oz.	dr.	lb.	oz.	dr.
4	10	06	4	11	14
7	14	12	2	13	12
5	07	04	7	10	15
9	14	15	4	07	14
4	05	07	6	09	06
6	11	14	4	07	10
39	00	10	30	13	07

But in weighing Worsted, and some other Things,
 'tis usual to go no lower than a quarter of an Ounce;
 as in these *Examples*.

(16)(4)			(16)(4)		
lb.	oz.	gr.	lb.	oz.	gr.
4	13	1	9	07	2
7	12	2	7	10	1
9	11	3	8	15	3
7	04	2	7	12	2
4	13	1	3	13	3
24	07	1	37	11	3

Wood is also weighed by *Avoirdupois* Weight, but differently divided, according to the following Table, viz.

C

Note,

Note, that	{	7 Pounds is one Clove,	}	or	{	lb.
		2 Cloves, one Stone,				14
		2 Stone one Tod,				28
		6 $\frac{1}{2}$ Tod, one Wey,				182
		2 Weys, on Sack,				364
		12 Sacks, one Last.				4368

And in a *Last of Wool*, are {

4368 Pounds,
624 Cloves,
312 Stone,
156 Tod,
24 Weys,
12 Sacks.

Note, That the Wey differs in some Countries ; as in *Suffolk*, the Wey is 336lb. or 42 Cloves ; in *Essex* 256 ; or 32 Cloves ; and according to the Division above, 182lb.

TROY WEIGHT.

By this Weight are weighed *Jewels, Gold, Silver, Pearls, Electaries, and Liquors*. A Pint of *Water, Wine, &c.* being a Pound. and the usual Denominations are *Pounds, Ounces, PennyWeights, and Grains*, as in the following Table.

Note, {

24 Grains
20 Penny-Weight
12 Ounces

} make {

1 Penny-Weight.
1 Ounce,
1 Pound.

In a Pound *Troy*, are {

5760 Grains.
240 Penny-Weights.
12 Ounces.

25lb. 1 Quarter of a Hundred.
 100lb. 1 Hundred Weight.
 20 Hundred 1 Tun of Gold or Silver.

The

The Value of Gold.

The Value of Silver.

	<i>l. s. d.</i>		<i>l. s. d.</i>
1 Pound Wt. is worth	48-00-0	1 Pound Wt.	3-00-0
1 Ounce — —	4-00-0	1 Ounce, —	0-05-2
2 Penny-Weight, —	0-04-0	1 Penny-Wt.	0-00-3
1 Grain — — —	0-00-2	1 Grain, $\frac{1}{2}$ a Farthing.	

A Tun of Gold at 4*l.* the Ounce, *l.* 96000.

A Tun of Silver at 5*s.* the Ounce, *l.* 6000.

Examples of Troy Weight.

	(12)	(20)	(24)
<i>l. oz. dwt. gr.</i>			
4	10	12	20
5	04	06	13
7	07	07	06
5	04	19	14
4	11	04	14
6	04	17	21
34	07	08	16

	(12)	(20)	(24)
<i>l. oz. dwt. gr.</i>			
5	10	10	11
4	11	17	19
6	10	01	10
5	06	14	15
4	10	14	17
2	05	04	04
30	07	03	04

	(12)	(20)	(24)
<i>oz. dwt. gr.</i>			
24	13	10	
19	11	15	
07	04	14	
21	13	16	
11	05	23	
08	04	12	
14	07	10	
15	10	11	
122	11	15	

	(12)	(20)	(24)
<i>oz. dwt. gr.</i>			
105	10	05	
217	06	08	
360	03	06	
195	11	07	
217	02	09	
196	02	08	
321	07	05	
172	08	11	
1785	11	11	

Here is no Occasion for Pointing, but only in the Grains: but if you do stop at more, only mind the Figures over the Titles, as before in *Avoirdupois Weight*, and they direct at what to Point.

Note, A Pound *Troy* is about 13 Ounces, 2 Drams and a half *Avoirdupois*; or as 17 to 14: And the Ounce *Troy*, as 51 to 56.

			<i>l. s. d.</i>
A Pound <i>Troy</i> of Gold	}	is worth	{ 48-00
A Pound <i>Avoirdupois</i> of Gold			

			<i>l. s. d.</i>
A Pound <i>Troy</i> of Silver	}	is worth	{ 3-03 0
A Pound <i>Avoirdupois</i> of Silver			

		<i>lb. oz.</i>	
100 <i>l.</i> in Gold weighs	1-11¾	}	<i>Avoirdupois</i>
100 <i>l.</i> in Silver weighs	26-04-0		

A Pound *Avoirdupois* is heavier than a Pound *Troy*; but the Ounce *Avoirdupois* is lighter than the Ounce *Troy*; for the Ounce *Troy* weighs 480 Grains, but the Ounce *Avoirdupois* only 438 Grains.

A P O T H E C A R I E S W E I G H T.

Apothecaries have their Weight deduced from *Troy*; their Pound being the same, to wit, 12 Ounces; but differently divided, as follows, *viz.*

20 Grains	}	make	{	1 Scruple
3 Scruples				1 Dram
8 Drams				1 Ounce
12 Ounces				1 Pound

By these Weights *Apothecaries* compound their Medicines; but they buy and sell their Drugs by *Avoirdupois Weight*.

Example

Examples.

(10)	(12)	(8)	(3)	(20)
lb.	oz.	dr.	scr.	gr.
4	10	7	2	9
3	10	6	1	10
2	09	5	0	06
1	08	4	2	04
1	06	3	1	12
1	00	0	0	00
15	10	3	2	1

(10)	(12)	(8)	(3)	(20)
lb.	oz.	dr.	scr.	gr.
48	7	1	1	17
12	11	4	2	12
24	06	7	1	07
19	10	5	2	12
34	07	6	0	00
24	04	4	1	15
165	00	6	1	03

In a Pound are { 5760 Grains
288 Scruples
96 Drams
12 Ounces

CLOTH MEASURE.

Note that { 4 Nails
4 Quarters
5 Quarters
3 Quarters } make { 1 Quarter
1 Yard
1 Ell Engl.
1 Ell Flem.

grs. N.
3 } or { 12 } make { 1 Ell Flemish
4 } { 16 } { 1 Yard
5 } { 20 } { 1 Ell English
6 } { 24 } { 1 French Aulme, or Ell.

Examples.

<i>Yls.</i>	<i>qrs.</i>	<i>Nls.</i>	<i>El. Eng.</i>	<i>qrs.</i>	<i>Nls.</i>	<i>El. Flem.</i>	<i>qrs.</i>	<i>Nls.</i>
(10)	(4)	(4)	(10)	(5)	(4)	(10)	(3)	(4)
14	1	3	24	3	3	25	2	3
21	2	2	17	4	1	36	1	2
56	1	0	46	2	2	42	2	3
42	2	3	27	1	0	54	2	1
17	0	1	34	4	3	61	1	2
24	1	2	51	2	2	72	2	3
176	1	3	202	3	3	294	1	2

LIQUID MEASURE.

Is of two Sorts; one for *Wine, Spirits, Oil, &c.* And the other for *Ale and Beer*, the Tables of which are as follows.

In WINE MEASURE

231 Solid Inches,	}	make	1 Gallon,
42 Gallons,			1 Tierce,
63 Gallons, or 1 Tierce, & $\frac{1}{2}$			1 Hoghead.
2 Hogheads,			1 Pipe, or But.
2 Pipes, or Butts.			1 Tun.
84 Gallons.			1 Puncheon.

By this Measure all Wines, Brandies, Spirits, Strong Waters, Cyder, Perry, Mead, Oil and Honey are sold.

In a Tun are	{	2016 Pints,
		1008 Quarters,
		252 Gallons.
		14 Rundlets.
		6 Tierces.
		3 Puncheons.
		4 Hogheads.
		2 Pipes, or Butts.

Notes

Note, 18 Gallons is a Rundlet.

31½ Gallons, is a *Wine* or *Vinegar-Barrel*.

A Tun weighs 18 C. *Avoir du pois*.

Note, *Oil* and *Honey* are measured by *Wine Measure*.

Note, that *Oil* hath but 236 Gallons to the Tun except *Whale Oil*, or *Oil* from *Greenland*, which hath 252 to the Tun.

IN BEER MEASURE.

282 Solid Inches,	}	make	{	1 Gallon.
9 Gallons,				1 Firkin.
2 Firkins,				1 Kilderkin.
2 Kilderkins,				1 Barrel.
1½ Barrel, or 54 Gallons				1 Hoghead.

Note, That in all other Places besides London, the *Firkin* of *Beer* and *Ale* contains 8½ Gallons.

In a Barrel of <i>Beer</i> are,	{	10152 Solid Inches.
		288 Pints.
		144 Quarts.
		72 Pottles.
		36 Gallons.
		4 Firkins.
	{	2 Kilderkins.

Note, That 3 Barrels, or 108 Gallons, make 1 Butt of *Beer*;

ALE MEASURE.

282 Solid Inches,	}	make	{	1 Gallon.
8 Gallons,				1 Firkin of <i>Ale</i> , <i>Soap</i> ,
2 Firkins,				or <i>Herrings</i> .
1½ Barr. or 48 Gal.				1 Kilderkin.
				1 Hoghead.

C 4

In

In a Barrel of *Ale* are, {

- 9024 Solid Inches.
- 256 Pints.
- 128 Quarts.
- 64 Pottles.
- 32 Gallons.
- 4 Firkins.
- 3 Kilderkins.

The *Beer* and *Ale* Gallons are the same, *viz.* 282 solid Inches, but with this Difference, *i. e.* the Barrel of *Beer* contains 1128 Cubic Inches more than the Barrel of *Ale*, that is, 4 Gallons.

Examples of Wine Measure.

(10) <i>Tuns.</i>	(4) <i>Hds.</i>	(63) <i>Gal.</i>	(8) <i>Pints.</i>	(10) <i>Tuns.</i>	(4) <i>Hds.</i>	(63) <i>Gal.</i>	(8) <i>Pints.</i>
71	2	19	4	75	2	24	7
24	1	27	6	44	1	17	2
12	2	56	4	27	1	46	6
42	0	37	7	29	1	19	4
15	3	60	2	24	3	46	4
166	3	12	7	201	2	28	7

D R Y M E A S U R E .

By this are measured all Sorts of *Grain*, *Salt*, *Sea-Coals*, &c.

Note, That {

- 2 Pints
- 2 Quarts
- 2 Pottles
- 2 Gallons
- 4 Pecks
- 8 Bushels
- 4 Quarters
- 5 Quarters
- 2 Wey

} is {

- 1 Quart,
- 1 Pottle,
- 1 Gallon,
- 1 Peck,
- 1 Bushel,
- 1 Quart. or 2 Combes,
- 1 Chaldron,
- 1 Wey,
- 1 Last.

Note,

Note, Four Pecks is one Bushel, land Measure, and 5 Pecks, one Bushel, Water Measure.

Observe likewise, That when *Salt* and *Sea-Coal* are measured by the Corn Measure, they are heaped; or else there are 3 striked Pecks to the Bushel; and 36 Bushels make a Chaldron of Coals; there being 21 Chaldron to the Score, in the River of *Thames*.

A Gallon contains $268\frac{4}{5}$ Cubic Inches; and a Bushel of Corn, $2150\frac{2}{3}$ Cubic Inches.

Note, A Bushel ought to be $18\frac{1}{2}$ Inches wide, and 18 Inches deep; as by Act of Parliament, in 1697.

Some make 6 Quarters of Meal a Wey; and 1 Wey, 3 Quarters, a Last.

Examples of Dry Measure.

(10)	(8)	(4)	(2)	(10)	(4)	(8)	(4)
Qu.	Bush.	Pecks.	Gal.	Chal.	Qu.	Bush.	Pecks.
24	6	2	1	174	3	6	3
17	3	2	0	241	1	7	2
20	7	1	1	296	2	4	3
15	5	0	1	171	1	5	0
21	2	1	1	097	0	5	2
19	4	2	0	471	2	4	3
119	5	2	0	1453	1	2	1

LONG MEASURE.

Note,	{	3 Barley Corns make one Inch.
		12 Inches one Foot.
		3 Foot one Yard.
		3 Foot 9 Inches, one Ell English.
		2 Yards, or 6 Foot, one Fathom.
		5 Yards $\frac{1}{2}$ or 16 Foot $\frac{1}{2}$, 1 Pole.
		40 Square Poles, or 220 Yards, one Furlong.
		8 Furlongs, or 1760 Yards, one Mile,
		3 Miles one League.
		60 Minutes 1 Degree, which is equal to about 69 <i>English</i> Miles.
		360 Degrees, or 24840 Miles is equal to the Circumference of the Earth and Sea.

Note, That an *English* Mile, is 286 Feet less than an *Italian* Mile. And that 5 Foot is a Geometrical Pace.

In a Mile are	{	190080 Barley-Corns,
		63360 Inches.
		5380 Feet.
		1760 Yards.
		320 Poles.
		8 Furlongs.
		80 Chains.
		1056 Paces.
		1408 Ells.
		8000 Links of the Gunter's Chain.

Examples

Examples in Long Measure.

(10) Miles.	(8) Furl.	(40) Poles.
24	6	22
37	5	26
15	4	34
74	3	39
41	7	24
194	4	25

(10) Miles.	(8) Furl.	(40) Poles.
37	4	21
20	3	17
42	5	19
31	6	27
52	4	19
185	0	23

From the preceeding Table of *Long Measure*, is deduced this of *Land Measure*, viz.

Forty Poles, (or Perches) in Length, and 4 in Breadth, make an Acre; or 160 square Perches. Or 4840 square Yards make an Acre; or 43560 square Feet.

A *Hide* of Land is 100 Acres; 40 square Poles make a Rood, and 4 Roods an Acre.

Note, the Pole, or Perch, of 16 Feet $\frac{1}{2}$ is *Statute Measure*; but there are some customary Measures which are more; as for Fens and Woodlands, there are reckoned 18 Feet to the Pole; and for Forests 21 Feet to the Pole.

Examples.

(10) Acres.	(4) Roods.	(40) Poles.
14	2	24
26	3	29
17	1	19
26	2	20
36	2	36
24	1	12
146	2	20

(10) Acres.	(4) Roods.	(40) Poles.
74	2	27
61	1	20
20	2	36
14	3	11
37	1	10
27	2	34
236	2	18

T I M E.

Is measured by Years, Months, Days, Hours, and Minutes as in the Table following :

<i>Mark'd</i>		<i>In a Year are.</i>
60' Seconds	} make	31557600 <i>Second.</i>
60' Minutes		525960 <i>Min.</i>
24 Hours,		8766 <i>Hours.</i>
7 Days		365 <i>Days.</i>
4 Weeks		52 <i>Weeks.</i>
12 Months		
	} make	
		1 Minute.
		1 Hour.
		1 Day natural
		1 Week.
	} make	
		1 Month.
		1 Solar Year.
(1 Day, and 6 Hours.		

A *Century* is 100 Years ; an *Indiction* among the *Romans*, a Revolution of 15 Years.

Of the Motion of the Heavenly Bodies.

60" Seconds	} make	1 Minute.
60' Minutes		1 Degree.
30 Degrees		1 Sign.
12 Signs, or 360 Degrees		1 Revolution of the
(whole <i>Sphere</i> , or 360 Degrees.		

D O Z E N S.

There are several Commodities sold by the Dozen, a Table of which follows, *viz.*

In a great Gross are	{	1728 Pieces or Things
	{	144 Dozens.
	{	12 Small Gross.

S Q U A R E

S Q U A R E M E A S U R E.

16 Quarters of an Inch	}	} is {	one Inch.
144 Inches			one Foot.
9 Foot			one Yard.
30 Yards $\frac{1}{2}$ or $272\frac{1}{4}$ square Feet			one Pole,
40 Poles long and one broad			one Rood.
4 Roods			one Acre.
640 Acres			one Mile.

In a square Acre are 4 square Roods, 160 square Poles, &c. and in a square Pole, 30 square Yards $\frac{1}{4}$

In a square Mile are,	{	4014489600 Inches.
		27878400 Feet.
		3097600 Yards.
		102400 Poles.
		2560 Roods.
		640 Acres.

Some other Things necessary to be known, and of Use in Arithmetic.

Of F I S H.

124 of *Ling, Codd, or Haberdine*, to the Hundred, viz.

120	}	accounted {	100
1200			1000
12000			A Last, or 12 Barrels,

P A P E R and P A R C H M E N T.

1 Bale is 10 Ream; 1 Ream 20 Quires; 1 Quire 24 (or 25) Sheets; 1 Roll of Parchment, 5 Dozen; 1 Dozen, 12 Skins.

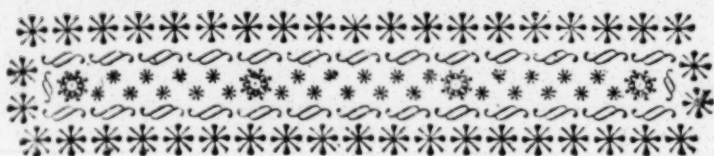
of

OF WOOD.

A Cord of Wood is 4 Feet over, 4 Feet deep and 8 Feet long, being 128 Cubic Feet. A Stack of Wood is 3 Feet over, 3 Feet deep, and 12 Foot long, being 108 Cubic Feet.

Block-Wood, being great Logs, are sold by the Cord, and small by the Stack. A Cubic Foot is 1728 Cubic Inches. A Cubic Yard 27 Cubic Feet, or 46656 Inches. 4 Inches is a Hand, in measuring a Horse. 2 Feet is 1 Pace, 4 Poles, or 100 Links, 1 Chain. 125 Geometrical Paces 1 Stade, 8 Stades an *Italian Mile*. 4000 Geometrical Paces a small *German Mile*, and 5000 a Great. 160 Perches in Length, and 1 in Breadth; or 80 in Length, and 2 in Breadth; or 40 in Length, and 4 in Breadth, make an Acre of Land. 10 Foot every Way is a *Square*; that is 100 square Feet A Faggot of *Steel*, 120lb. A Burthen of *Gadsteel* 9 Score, or 180lb. A Sack of Coals, 3 Bushels; *Scots Coals* 112lb. to the C. A Load of Timber 50 Foot, a Tun 40. A Load of Hay, 36 Trusses, and 56lb. the Truss; or 4 Stone, at 14lb. the Stone; but new Hay ought to be 60lb the Truss. 500 of bricks a Load; and 1000 plain Tiles the same. 25 Bushels of Lime 1 C. A Brick ought to be 9 Inches long, $4\frac{1}{2}$ broad, and $2\frac{1}{2}$ thick. A Tun of Train-Oil, 252 Gallons; a Tun of Sweet-Oil 236 Gallons. Raw-Silk (except *China*) is 24 Ounces to the Pound. A Tun of Lead called a Fodder, $19\frac{1}{2}$ C. A Gallon of wheaten Meal weighs 7lb. *Avirdupois*. A Dicker of Hides, or Skins, are 10; and 20 Dickers a Last. A Stone of Glass is 5lb; a Seam of Glass is 24 Stone. 40 Skins make a Timber of *Sables*, *Martins*, *Minks*, *Jennits*, *Fitches* and *Greys*. 120 to the Hundred of *Conies*, *Kid*, *Lamb*, *Budge*, and *Cat-skins*; 50 to a Kid of *Goat-skins*; and 13 tann'd *Calf-skins* a Dozen.

SUB.



CHAP. III.

SUBTRACTION.

IS the taking of a lesser Number, or Sum, out of a greater, thereby to find the Remainder, or Difference between the said two Numbers: As if you take 13 from 19, the Remainder, or Difference is 6.

SUBTRACTION is of one Denomination, or of divers.

Of one, when the two Numbers are both of one Kind; that is, both *Yards, Gallons, Pounds, &c.*

Of divers, when the two Sums consist of *Pounds Shillings, and Pence, or Tuns, Hundreds, Quarters, and Pounds, &c.*

SUBTRACTION is just the Reverse of *Addition*; for *that* puts Numbers together, and *this* takes Numbers from each other.

In setting down Numbers for Work, you must always place the greater Number, or Sum, uppermost; and in such Order that Units may stand under Units, Tens under Tens, Hundreds under Hundreds, as before in *Addition*.

A General Rule.

Whatever you stop at in *Addition*, the same you borrow in *Subtraction*, when Need requires, remembering always to pay it to the next Figure towards the left Hand.

Example.

Example 1.

Suppose I would know the Difference between 453 Yards bought, and 232 Yards sold.

I set them down as underneath, and as before recited viz.

	<i>Yards.</i>
<i>Bought,</i>	453 Greater Number.
<i>Sold,</i>	232 The Lesser.
<i>Difference,</i>	221 Remains, unfold.
	453 Proof.

After I have drawn a Line under the Sum, I begin at the first Figure towards the Right Hand, (as in *Addition*) and say, 2 from 3, (the Figure just over it) and there remains 1, setting it in its proper Place under the Line; and then go to the next Figure, saying, 3 from 5, and there remains 2, which I also put under the Line; and then to the last Figure, saying, 2 from 4, and there remains 2, and the Work is done; and I find the Remainder of Yards unfold to be 221; or that 453 is 221 more than 232; to prove the Truth of which, I add the Remainder, or Difference, to the Lesser Number; and if they Two, put together, make the greater, or upper Number, the Sum is right, otherwise not; wherefore I say, 1 and 2 is 3; and 2 and 3 is 5; and 2 and 2 is 4, which are the same Figures with the upper or greater Number. Wherefore I know the Work is right, as may be seen in the Example. And by this Way are all Sums of one Denomination prov'd in this Rule.

Example 2.

Let it be required to find the Difference between 756 Gallons received, and 444 Gallons delivered. To do which

which, I set the Numbers, the one under the other, as before directed, and they stand thus,

$$\begin{array}{r}
 \text{Gall.} \\
 756 \text{ Greater.} \\
 444 \text{ Lesser.} \\
 \hline
 312 \text{ Rem.} \\
 \hline
 756 \text{ Proof.} \\
 \hline
 \end{array}$$

Then having drawn a Line under them, I begin and say, 4 from 6, and there rests 2; and 4 from 5, and there remains 1; and 4 from 7, and there remains 3: So the Work being done, I find the Difference to be 312; or so many Gallons remaining. And it is proved by *Addition*, as before; as may be seen by the Work above.

When any one of the under Figures is greater than the Figure over it, than you must borrow 10, (as you carried 10 in *Addition*) and put it to the Figure from whence you were to subtract, and then take it from their Sum, paying 1 for the said 10 borrowed, to the next Figure towards the left Hand in the lower Line.

Example 3.

I would subtract 496 Pounds paid, from 654 Pound lent, viz.

$$\begin{array}{r}
 \text{l.} \\
 \text{Lent,} \quad 654 \text{ Greater.} \\
 \text{Paid,} \quad 496 \text{ Lesser.} \\
 \hline
 158 \\
 \hline
 654 \text{ Proof.} \\
 \hline
 \end{array}$$

Having set down the Numbers, as before directed with a Line under them, I say, 6 from 4 I cannot, but (putting

ing 10 to the said 4, it is made 14) 6 from 14, and there remains 8, which I set down under the Line; then I say, 1 that I borrowed, and 9 (the next Figure) is 10, from 5 I cannot, but 10 from 15, (adding 10 to the 5) and there rests 5, which I also set down; then, 1 that I borrowed, and 4 is 5, from 6, and there remains 1. The Sum being thus finished, I find that there remains due, or unpaid, 158 Pounds, which is proved by *Addition*, as before.

Example 4.

Suppose there is advanced on a *Subsidy*.

	<i>l.</i>
	636420
Paid off,	47294
Remainder,	589126
Proof.	636420

How much remains ?

Here I say, 4 from nothing I cannot, but 4 from 10, and there remains 6; 1 that I borrowed, and 9 is 10, from 2 I cannot, but 10 from 12, and there rests 2; then 1 that I borrowed, and 2 is 3, from 4, and there remains one; (here I borrow none, so must not pay any thing to the next Figure) then 7 from 6 I cannot, but 7 from 16, and there remains 9; 1 that I borrowed, and 4 is 5, from 3 I cannot, but 5 from 13, and there remains 8; and now, because there is no Figure standing under the 6, to carry the 1 borrowed to, I suppose a (0) to be placed there, and say, 1 that I borrowed, and 0 is 1, from 6, and there remains 5; and so the Work is done, and the Remainder is 589126, as in the *Example*.

More

More Examples for Practice.

	<i>l.</i>		<i>Elk.</i>
Borrowed,	14075	Bought,	74000
Paid	08424	Sold,	29460
Rest due,	5651	Rest unfold,	44540
Proof,	14075	Proof,	74000

	<i>Sheep.</i>		
Received	492	Advanced,	47692
Delivered,	397	Paid off,	29767
Remains,	95	Remains,	17925
Proof,	492	Proof,	47692

Some Questions proper to this Rule, shewing its Nature and Use.

Quest. 1. What is the Difference
between a Piece of Timber, contain-
ing 56 Feet, and another Piece of
29 Feet?

Feet

56

29

Ans. 27

Quest. 2. A Man borrowed, *l.* 96
and paid 58, what remains
due?

96

58

Ans. 38

Quest.

Quest. 3. If a Person hath 150 Miles to travel, and hath gone 99 Miles, how many Miles hath he yet to go?

Miles.

150

99

Answ. 51

*From 100 Pounds borrowed, take 72 paid?
'Twas a Virgin that lent it, what's due to the Maid?*

Answ. L. 28

Quest. 4. If a Person be 48 Years of Age this present Year, what Year was he born in?

Years.

1754

48

Answ. 1706

Quest. 5. How many Years since the *Spanish Invasion*, it being in the Year 1588?

r.

Greater Number, 1754

Lesser Number. 1588

166

*From 90 take 30, from 40 take 10;
Subtract 6 from 60, and what remains then?*

Answ. 144

Quest.

Quest. 6. What Number must be put to 297. to make it 730?

730

297

Answ. 437

Proof. 730

*In Fifteen Hundred 92 there dy'd a noble Prince:
How many Years is it ago, that is, how many since?*

1754

1592

Answ. 162

Quest. 7. What five Numbers, and all different, will make 65?

To do this, set down four different Numbers at random, observing that they do not amount to the Number proposed; and add them together, and subtract that Total from the Number proposed, and the Remainder will be the fifth Number, to make the other Numbers 65, as in the following

Example.

65 The Number proposed.

12

13

9 The four Numbers set

16 down at random.

50 Total.

15 The 5th Number.

And

And so of any other Number proposed to be made up by different Numbers, let them be 5, 6, 7, &c. Remembring always that, the random Numbers be less than the Numbers proposed to make up the Number assigned.

Of MONEY.

When the Sums to be subtracted, are of divers Denominations, whither they be *Money, Weight, or Measure*, the same Method must be observed in setting them down as in *Addition*; that is, the several Names must be set just under one another; as Pounds under Pounds, Shillings under Shillings, and Pence under Pence, &c. with *Points, or Strokes of Separation* between them; always observing that the great Sum must be uppermost, as before, in Sums of one Denomination. Then proceed to take the under Sum out of the uppermost, beginning at the least Denomination towards the right Hand, as is *Addition*; and the same Respect must be had, when there is Occasion to borrow as before in *Addition*, observing how many of the lesser Denomination makes one of the next greater, and borrow accordingly; remembring always to pay what you borrow to the next Denomination.

Example.

I would subtract 247*l.* 11*s.* 6*d.* $\frac{1}{2}$. *Disbursements*, from 372*l.* 11*s.* 9*d.* $\frac{1}{4}$. *Received*. To do which, I set them down as before directed; and then they stand thus.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	
Recived,	372	11	6 $\frac{1}{4}$	Greater.
Disburfm.	247	11	9 $\frac{1}{2}$	Lesser,
Remains.	124	19	8 $\frac{3}{4}$	
Proof.	372	11	6 $\frac{1}{4}$	

I begin

I begin at the least Denomination towards the right Hand, *viz.* Farthings; saying 2 from 1 I cannot, wherefore I borrow one from the next Name, which is Pence, one of which is 4 Farthings, but 2 from 4 and there remains two, (which Remainder always add to the upper Number, or Figure you subtract from, for the more easier Reckoning) and the 1 Farthing over it makes $\frac{3}{4}$, which I place under the Line, and go to the next Denomination of Pence, saying, 1 that I borrowed, and 9 is 10, from 6 Pence I cannot, but I borrow one of the next, which is Shillings, one of which is 12 Pence; but 10 Pence from 12 Pence, and there remains 2, which I put to the Figure 6 I subtract from, and it makes 8, which I also put under the Line, in its proper place; and then I go to the next Denomination, which is Shillings, saying 1 that I borrowed, and 11 is 12, from 11 Shillings I cannot, wherefore I borrow one of the next which is Pounds, (one of which is 20 Shillings) but 12 from 20 and there remains 8, and the 11 Shillings over it, which I Subtract from, is 19, which I place under the Line, in its Place, then going to the Pounds, I say, 1 that I borrowed, and 7 is 8, from 2 I cannot, (here I borrow 10, as in Sums of one Denomination) but 8 from 12, and there remains 4; then, 1 that I borrowed and 4 is 5, from 7 and there remains 2; and lastly, 2 from 3, and there remains 1: And so the Sum is finished; and the Remainder or Difference is 124*l.* 19*s.* 8*d.* $\frac{3}{4}$. as by the Example may be seen.

Example 2.

A Collector of the *Excise*, has received 2479*l.* 12*s.* 6*d.* $\frac{3}{4}$. and paid into the Office by several Remittances, 1977*l.* 11*s.* 2*d.* How much remains in his Hands?

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Received,	2479	12	6 $\frac{3}{4}$.
Paid,	1977	11	2
	502	01	4 $\frac{3}{4}$
Proof	2470.	12	6 $\frac{3}{4}$

Here

Here I begin, and say, nothing from $\frac{3}{4}$, and there remains $\frac{3}{4}$; and 2 from 6, and there remains 4; and 11 from 12, and there remains 1; and then I go to the Pounds, saying, 7 from 9, and there remains 2; and 7 from 7, and there remains 0; and 9 from 4 I cannot, but 9 from 14, and there remains 5; and that I borrowed, and 1 is 2, from 2 and there remains 0; and so the Sum is done; and he hath remaining in his Hand, 502*l.* 01*s.* 4*d.* $\frac{3}{4}$, as by the said Work.

More Examples for Practice.

(20)(12)			(20)(12)			(10)(20)(12)		
<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
From 7	10	1	5	00	0	77	00	7
Take 4	07	9	3	11	5	57	04	6
Rem. 3	02	4	1	08	7	19	16	1
Proof. 7	10	1	5	00	0	77	00	7

(20)(12)(4)				(20)(12)(4)				(20)(12)(4)			
<i>l.</i>	<i>s.</i>	<i>d.</i>		<i>l.</i>	<i>s.</i>	<i>d.</i>		<i>l.</i>	<i>s.</i>	<i>d.</i>	
Dr. 7	11	1	$\frac{1}{4}$	476	10	9	$\frac{1}{4}$	7	00	0	
Cr. 4	17	3	$\frac{1}{4}$	277	17	7	$\frac{1}{4}$	4	10	4	$\frac{3}{4}$
Bal. 2	13	10	$\frac{1}{4}$	198	13	2		2	09	7	$\frac{3}{4}$
Pr. 7	11	1	$\frac{1}{4}$	476	10	9	$\frac{1}{4}$	7	00	0	

(10)(20)(12)(4)				(10)(20)(12)(4)			
<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>qr.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>qr.</i>
Borrowed, 4	19	02	$\frac{1}{4}$	7	17	11	1
Paid, 1	97	03	$\frac{1}{2}$	2	176	15	9 $\frac{1}{4}$
Rem. due, 2	21	18	$\frac{1}{4}$	4	997	15	3 $\frac{1}{4}$
Proof. 4	19	02	$\frac{1}{4}$	1	74	11	1

When

When a Sum is borrowed, or a Debt paid, at several Times, than you must add the several Sums of Payment into one Total, and subtract that Total from the first lent, or otherwise due,

Example.

Suppose *A.* lends *B.* 70*l.* and *B.* hath paid *A.* at several Times, viz.

Lent,	—	—	—	70	00	0
Paid at one Time,	—	—	—	24	10	0
Another Time,	—	—	—	7	11	6
Another,	—	—	—	20	00	0
Another,	—	—	—	4	10	6
Another,	—	—	—	1	01	6
<i>Paid in all.</i>				57	13	6
<i>Remains due,</i>				12	06	6
<i>Proof,</i>				70	00	0

To prove this, add the Sum paid in all, and the Sum resting due, together; and if they make the Sum first lent, the Work is right,

	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
Lent	7	10	0	560	10	9 $\frac{1}{2}$	1	01	6
Paid at several Times.	1	10	6	146	10	5	0	07	6
	0	11	9	17	15	0	0	01	6
	0	07	6	97	7	6	0	02	6
	2	10	6	76	00	0	0	01	6
	0	07	9	100	17	4	0	02	0
	1	10	0	100	01	7	0	01	0
Pd. in all	6	13	0	538	11	10	0	16	0
Rem.	0	12	0	21	18	11 $\frac{1}{2}$	0	05	6
Proof.	7	10	0	560	10	9 $\frac{1}{2}$	1	01	6

D

A

A familiar Example.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Received of Mr. East, — — — —	59	06	0
<i>pd.</i> to Mr. West, — — — — —	20	00	0
<i>pd.</i> to Mr. North, — — — — —	14	13	6
<i>pd.</i> to Mr. South, — — — — —	15	12	0
Paid in all	50	05	6
Remains in the Bag,	09	00	6

What eight Sums of Pounds, Shillings and Pence, and all different, will amount to just 50*l.*

To do this, you must observe the Directions given in Page 47. *Example 7.* for the Sums of one Denomination; and see the following Work,

From *l.* 50 00 0 the Sum assigned.

	4	17	6
	5	01	6
The Seven Sums	1	01	6
set down at ran-	7	11	4
dom.	6	04	2
	9	03	9
	1	13	5
Subtract	35	13	2
Remainder,	14	06	10

The eight Sum.

AVOIRDUPOIS-WEIGHT.

Here you are only to observe the Title of your Account, and borrow according, when there is Occasion.

Example

Example 1.

An Ironmonger buys 74 Tuns, 13C. 2qrs. 14lb. of Bilbao Iron, and hath sold out of the said Parcel, 56 Tons, 1C. 1qr. 20lb. how much remains unsold?

I set down the Sum as before directed, that each Denomination may stand under that of the same Kind, and draw a Line under them, as may be seen in the Margin.

I begin at the right Hand,

and say, 20 from 14 I cannot, but 20 from 28, (so many lb. making a qr. of a

Hundred an Integer of the Next Name) and there remains 8; which add to the

14, and they make 22, which

I place under the Line; and

go to the Quarters, and say

1 that I borrowed, and 1 is

2, from 2, and there remains 0; which I also set down;

then 11 from 13C. and there rests 2, which I likewise put

down, and go to the Tuns, saying 6 from 4 I cannot,

but 6 from 14, and there remains 8; then one that I bor-

rowed, and 5 is 6, from 7, and there rests 1. And so

the Work is done, and I find there remains unsold 18 Tuns,

2C. 0qr. 22lb.

(10) (20) (4) (28)
Tuns. C. qrs. lb.

74 13 2 14

56 11 1 20

18 02 0 22

proof. 74 13 2 14

Example 2.

A Grocer buys 96C. 2qrs. 20lb. of Raisins, and sells out again, 49C. 3qrs. 24lb. what Quantity remains in his Hands?

C. qrs. lb.

Bought,

96 2 20 Greater Number.

Sold,

49 3 24 Lesser Number.

Remains in his Hands 46 2 24

Proof.

96 2 20

D 2

Here

Here I say, 24 from 20 I cannot, but 24 from 28, and there remains 4; and the 20 over it, makes 24, which I set down: then one that I borrow, and 3 is 4, from 2 I cannot, but 4 from 4, and there tells 0; but 2 they stands over it, is 2, which I set down: then 1 that I borrowed, and 6 is 7 from 6 I cannot, but 7 from 10, and there tells 9, and 1 that I borrowed, and 4 is 5, from 9, and there remains 4. So there remains in his Hands 46*C.* 2*grs.* 24*lb.* which is proved by *Addition*, by adding the *Remainder* and *Lesser Sum* together, and they make the *Greater*: and therefore the Work is right.

Examples for Practice.

	(10)	(20)	(4)	(28)
	<i>Tun.</i>	<i>C.</i>	<i>grs.</i>	<i>lb.</i>
<i>Received,</i>	700	11	1	17
<i>Deduct.</i>	421	04	2	20
<i>Rem.</i>	279	06	2	25
<i>Proof.</i>	700	11	1	17

	(10)	(4)	(28)
	<i>C.</i>	<i>grs.</i>	<i>lb.</i>
	756	3	24
	327	1	25
	429	1	2
	756	3	25

<i>C.</i>	<i>grs.</i>	<i>lb.</i>
4	0	12
3	1	07
0	3	05
4	0	12

<i>C.</i>	<i>grs.</i>	<i>lb.</i>
24	1	12
19	2	24
04	2	16
24	1	12

<i>C.</i>	<i>grs.</i>	<i>lb.</i>
9	0	00
5	3	15
3	0	13
9	0	00

Admit, I have on board of a Ship from *Jamaica*, 9*Tun.* 13*C.* 0*grs.* 00*lb.* of *Log Wood*, and have received by several *Lighters*, as follows, viz,

On

	(10)	(20)	(4)	(28)
	<i>Tons, C. qrs. lb.</i>			
On Board, — — — —	94	13	0	00
By one Lighter, — — — —	12	11	3	09
Another, — — — —	19	14	0	21
Another, — — — —	17	12	2	24
Another, — — — —	15	14	3	06
Received, — — — —	65	13	2	04
Remains on board, — —	28	19	1	04

	(10)	(4)	(28)		(10)	(2)	(28)
	<i>C. qrs. lb.</i>				<i>C. qrs. lb.</i>		
	49	3	22	<i>Currants,</i>	70	2	20
<i>Sold at several Times.</i>	4	1	24		10	1	14
	9	2	17		7	2	14
	4	1	25		1	1	20
	7	3	20		12	1	19
	8	1	27		9	3	12
	9	2	20		10	0	00
<i>Sold in all,</i>	44	2	21		51	2	23
<i>Rem. unfold</i>	5	0	19		18	3	25
Proof.	49	3	22		70	2	20

AVOIRDUPOIS SMALL WEIGHT.

	(10)	(16)	(16)		(10)	(16)	(16)
	<i>lb. oz. dr.</i>				<i>lb. oz. dr.</i>		
<i>Delivered,</i>	4	10	14		46	13	10
<i>Received,</i>	2	09	0		27	15	14
<i>Rem.</i>	2	01	05		18	13	12
Proof.	4	10	14		46	13	10

D 3

Delivered

	(10)	(16)	(16)		(10)	(16)	(16)
	<i>lb.</i>	<i>oz.</i>	<i>dr.</i>		<i>lb.</i>	<i>oz.</i>	<i>dr.</i>
Delivered	55	00	00		79	15	14
Received	37	10	14		49	15	15
Refts due	17	05	02		29	15	15
Proof.	55	00	00		79	15	14

TROY-WEIGHT.

	(10)	(12)	(20)	(24)		(10)	(20)	(24)
	<i>lb.</i>	<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>		<i>lb.</i>	<i>dwt.</i>	<i>gr.</i>
Received	24	09	14	12		756	12	15
Melted	19	07	15	20		478	11	22
Remains	03	01	18	16		278	00	17
Proof.	24	09	14	12		756	12	15
	(10)	(12)	(20)	(24)		(10)	(20)	(24)
	<i>lb.</i>	<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>		<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>
Received	370	07	12	20		7420	15	20
Delivered	174	11	09	22		5789	18	15
Remains	195	08	02	22		1630	17	05
Proof.	370	07	12	20		7420	15	20

CLOTH-MEASURE.

	(10)	(4)	(4)		(10)	(5)	(4)
	<i>Fds.</i>	<i>grs.</i>	<i>N.</i>		<i>Ells Eng.</i>	<i>grs.</i>	<i>N.</i>
Bought	54	2	2		420	3	2
Sold	27	2	3		247	0	3
Remains	26	3	3		173	2	3
Proof.	54	2	2		420	3	2

I might give Examples in *Subtraction* of all the other Rules mentioned before in *Addition*, viz. of *Apothecaries Weight*, *Dry* and *Liquid Measure*, &c. but all of them being worked in the same manner with those before, it is unnecessary.



CHAP. IV.

MULTIPLICATION.

IN this Rule there are always two Numbers given to find out the Third, which will contain either of the given Numbers, as often as the other containeth Units.

II. This Rule also excellently and most concisely performeth the Work of *Addition*, either in simple or compound Numbers; as shall be illustrated and proved by sundry *Examples*, *Explications*, and *Improvements*, not hitherto treated of.

III. It likewisc serveth to bring great Denominations into less, of the same Value; as *Pounds* into *Farthings*; and *Tuns Weight* into *Pounds*, &c.

IV. *Multiplication* hath three Parts, or Things, particularly to be noted, and known, viz.

1st The *Multiplicand*, or Number to be multiplied; and is generally the greatest of the two Numbers given.

2^{dly} The *Multiplier* or Number by which you multiply; and is generally the least of the two Numbers given.

3^{dly} The *Product*, or Result of the *Multiplication*; which is the Answer.

V. Before any Procedure can be made, the following Table must be got perfectly by Heart.

MULTIPLICATION-TABLE.

3 Times or rather twice	2 is	4
	3	6
	4	8
	5	10
	6	12
	7	14
	8	16
	9	18
	10	20
	11	22
	12	24

5 Times	3 is	9
	4	12
	5	15
	6	18
	7	21
	8	24
	9	27
	10	30
	11	33
	12	36

4 Times	4 is	16
	5	20
	6	24
	7	28
	8	32
	9	36
	10	40
	11	44
	12	48

5 Times	5 is	25
	6	30
	7	35
	8	40
	9	45

5 Times	10 is	50
	11	55
	12	60

6 Times	6 is	36
	7	42
	8	48
	9	54
	10	60
	11	66
	12	72

7 Times	7 is	49
	8	56
	9	63
	10	70
	11	77
	12	84

8 Times	8 is	64
	9	72
	10	80
	11	88
	12	96

9 Times	9 is	81
	10	90
	11	99
	12	108

10 Times	10 is	100
	11	110
	12	120

11 Times	11 is	121
	12	132

12 Times	12 is	144
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The

The foregoing Table is so Plain and easy, that it needs no Explanation; and therefore I shall proceed immediately to the Rule of working.

VI. When any Number is given to be multiplied by another, set the biggest uppermost, which is the *Multiplicand*, and under that your *Multiplier*, in the same Order as in *Addition* and *Subtraction*, viz. Units under Units, Tens under Tens, &c. Then draw a Line and proceed, beginning at the right Hand, and multiply every particular Figure of the *Multiplicand* by the *Multiplier*.

Example 1.

How much is 3 times 472 *Multiplicand*.
3 *Multiplier*.

Ans. 1416 Product.

Here I say, 3 times 2 is 6, which I put under the Line, as in the *Example*; then 3 times 7 is 21, I set down 1, and carry 2; for the two Tens, to the next (as in *Addition* of one Denomination;) then 3 times 4 is 12, and 2 that I carry is 14; so because it is the last Figure, I set down 14, and the Work is done; so I find that 3 times 472 is 1416, the *Product*, or Result of 472 multiplied by 3.

If the said 472 be 3 times set down, one under the other, and added together, the Total will be the same with the *Product* above, which shews, that *Multiplication* briefly performs the Work of *Addition*, (as was said before) which is shewn in the Margin.

4	7	2
4	7	2
4	7	2
1	4	1
6		

Example 2.

How many makes 742 *Multiplicand*.
 Multiplied by 4 *Multiplier*.

2968 *Product*,

Here I say, 4 times 2 is 8, which I set down under the Line; then 4 times 4 is 16; I set down 6, and carry 1 for the Ten to the next Figure; then 4 times 7 is 28, and 1 that I carry is 29; and it being the last, I set it down: so the Work is done, and I find the Product, or Answer, to be 2968, as above.

To prove the Work, multiply the *Multiplier* by the *Multiplicand*, and if the Product is the same Figures as before, it is right. This is the quickest and best Way of proving *Multiplication*, till *Division* be known.

I do not move the Sum to any other Place, but let it stand as before multiply'd, and begin with the first Figure of the *Multiplicand*, towards the right Hand, to multiply the *Multiplier*, saying, twice 4 is 8, which I find to be right. Then to the next Figure, which is 4, and multiply the *Multiplier*, by that, saying, 4 times 4 is 16, which is 6, and carry 1, which I also find right. Then to the next and last Figure in the *Multiplicand*, which is 7, and multiply the *Multiplier* 4 by that also, saying, 7 times 4 is 28, and one that I carried is 29, which I likewise find right: And so the Work is prov'd, and known to be truly wrought.

Example 3.

What is the Product of 90704 *Multiplicand*.
 Multiplied by 8 *Multiplier*.

725632 *Product*

Here

Chap. 4 M U L T I P L I C A T I O N . 61

Here I begin, saying, 8 times 4 is 32, I set down 2, and carry 3; then 8 times 0 is 0, but 3 that I carry is 3; then 8 times 7 is 56, I set down 6, and carry 5, and then 8 times 0 is 0, but 5 that I carry is 5. Lastly 8 times 9 is 72, which I set down and the Work is done; as by the *Example* above. And this is proved as before, by multiplying the *Multiplier* by the *Multiplicand*, saying 4 times 8 is 32, &c.

This Way of Proof is also a perfecting any one in the *Multiplication-Table*; because the Digits, or Nine Figures, are multiplied forwards and backwards: So that they may as readily answer, that 9 times 8 is 72 (not found in the Table, but reverfely) as that 8 times 9 is the same.

More Examples for Practice.

Multiply 7460 *Multiplicand*.
By 7 *Multiplier*.

—————
52220 *Product, or Answer.*
—————

How many are 9 times 365?
Or, how many Days in 9 Years

—————
3285
—————

Multiplicand 432107
Multiplier 5
—————
2160535
—————

596324
 6
—————
3577944
—————

709543
 7
—————
4966801
—————

675908
 8
—————
5407264
—————
D 6

7654309
 9
—————
68888781
—————
VII.

VII. When the Multiplier consists of more Figures than One, then there must be as many several Products as there are Figures in the Multiplier, and placed under the Line and added together, and the Total is the whole Product required. But observe always to place the first Figure of each Product just under the Figure you multiply by, and so you move one Place towards the left Hand for every Product, be as many as there will.

Example 1.

How much is 24 times
or, how many Hours in a Year?

365 Multiplicand.
24 Multiplier.

1460 Product by 4.
730 Product by 2.

8760 Total Product.

The Numbers being placed in Order, as above, and according to the VIth *Rule* of this Chapter, after having drawn a Line under them, I begin with the first Figure in the Multiplier, *viz.* 4, saying, 4 times 5 is 20, set down 0, and carry 2: then 4 times 6 is 24, and 2 I carry is 26, that is 6 and carry 2; then 4 times 3 is 12, and 2 is 14; and so I have done with the Figure 4. Then I go to the second Figure in the Multiplier, *viz.* 2 and multiply the Multiplicand 365, by that also, saying, twice 5 is 10, I set down 0 and carry 1, which 0 I set down just under the Figure 2, that I multiply by, and go a Place farther to the left Hand, as was said before. Then I go on, saying, twice 6 is 12, and 1 that I carry is 13, that is 3, and carry 1, and twice 3 is 6, and 1 is 7; and so I have done with this Figure of the Multiplier also; and then I draw a Line under these two Products, and add them together, and they make 8760 for Answer. And so the Work is done, as may be seen in the *Example* above, and may be proved as before.

Example

Example 2.

$$\begin{array}{r}
 \text{Let it be required to multiply} \quad 527537 \\
 \text{By} \quad \text{---} \quad \text{---} \quad \text{---} \quad \text{---} \quad \text{---} \quad \text{---} \quad \text{---} \quad 285 \\
 \hline
 \quad \quad \quad 2637685 \\
 \quad \quad 4220296 \\
 \quad 1055074 \\
 \hline
 150348045
 \end{array}$$

A Line being drawn under the two Numbers, I proceed, saying, 5 times 7 is 35, &c. going thro' all the Figures of the Multiplicand by 5, and find its Product to be 2637685, then I go to the next Figure in the Multiplier, viz. 8, and multiply all the Figures in the Multiplicand by that also; and find the Product 4220296, then I multiply the Multiplicand by the last Figure, viz. 2, and the Product of that is 1055074. Then drawing a Line under these Products, I add them together, and find their Total to be 150348045, for the true Product sought: That is, I find that 285 times 527537 amounts to 150348045; as by the Work above may be seen.

VIII. Whenever the Multiplier is such a Number, that any two Numbers of the Multiplication-Table being multiplied together, make the said Multiplier; as in the foregoing Page, where the Multiplier is 24, and is made by Multiplying 6 and 4 together; then if you multiply the Multiplicand by either of them Numbers, that is, either 6 or 4, and then multiply that Product by the other Number, the last Product shall be the Answer, and the same with the other Way.

Example

Example.

By	365 Multiplied
	4
	1460
	6
	8760

Product agreeable to the 1st *Example*.
 ——— And so of any other.

There are, sometimes, Figures saved by this Method; and there is no Addition of Products.

More Examples.

4766	6726	476
14	17	19
19064	47572	4284
4766	6726	476
66724	115832	9044
56071592		275827
123		19725
168214776		1379135
112143184		551654
56071592		1930789
6896805816		2482443
		275827
		5440687575

How

Chap.

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X

How to prove Multiplication by the Cross.

The common Way used in *Schools* is this : They make a *Cross* thus, X, then add all the Figures in the Multipl-
cand together, as in *Addition*, and cast away the Nines, as
oft as they arise, and bear the Remainder to the next Fi-
gure ; when they come to the End of the Line, they note
what remains after the Nines are cast away, and set such
Remainder on the left Side of the *Cross* ; then they do the
same by the Multiplier, and note what remains there also,
setting that on the Right of the *Cross* ; then they multiply
them two Figures together, and cast the Nines out of that
Product, setting the Remainder on the Top of the *Cross* :
Lastly, they cast away the Nines out of that Product, and
if the Remainder be like the Figure on the Top of the
Cross, they set it down at the Bottom, and conclude the
Work right.

But this way of Proof is not infallible, as I have ex-
perienced many times : But this may be said for it, that
if a sum be done right, it will never appear wrong by
this Way ; but it many times makes a sum appear right
when it is utterly false ; and therefore is not to be depend-
ed on as a certain *Proof*. I'll give one *Example*, to make
the foregoing Directions the more intelligible ; which
shall be one of the preceding Sums set down again here,
viz the Second foregoing.

$$\begin{array}{r}
 \begin{array}{ccc}
 & 3 & \\
 8 & \text{X} & 6 \\
 & 3 &
 \end{array}
 &
 \begin{array}{r}
 56071592 \text{ Multiplicand} \\
 123 \text{ Multiplier} \\
 \hline
 6896805816 \text{ Product.} \\
 \hline
 \end{array}
 \end{array}$$

Here, after having made the *Cross*, thus : X
I begin at the Multiplicand, it's no matter at which End ;
but I'll begin towards the left Hand, saying, 5 and 6 is
11, I cast away 9, and there rests 2, and 2 and
7 is 9, and there rests nothing ; then 1 and 5 is
6 (I miss the 9) and 2 is 8, which I set on the
left of the *Cross*, as it appears in the *Margin*.
Then

Then going to the Multiplier, I say, 1 and 2 is 3, and 3 is 6, which I place on the Right. Then multiply one by the other, saying, 8 times 6 is 48, I cast away 5 Nines out of it, and there remains 3, which I put to the Top, as you see in the Margin. After the same Manner I cast away the Nines out of the Product, and at the last there remains 3 likewise, and so the Work is done.

Note, That the Figures on each Side of the Cross, being multiplied, make 48, and if you add them two Figures together, as they stand, and cast away the Nines, the Remainder, will be the same; that instead of saying, how many Nines in 48; you say 8 and 4 is 12; the Nines in 12 once, and there remains 3, as before.

IX. The greatest Difficulty in Multiplication, is, when there is a Cypher or Cyphers, intermixt with the Figures. In such Cases, only remember what was said before, in the VIIth Rule, to move for every Figure, or Cypher, one Place toward the left Hand, and to take Care that each first Figure of the several Products stand directly under its respective Multiplier; an *Example* will make it easy to be understood.

Let it be required to multiply 50710984, by 4050607, having set the Numbers down as before directed, with a Line under them, they stand thus.

$$\begin{array}{r}
 50710984 \text{ Multiplicand,} \\
 4050607 \text{ Multiplier.} \\
 \hline
 354976888 \\
 3042659040 \\
 2535549200 \\
 2028439360 \\
 \hline
 205410266767288
 \end{array}$$

Here

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Here I begin, saying 7 times 4 is 28, &c. and so go through the Multiplicand by 7, and find its Product 2800000000; then I come to a Cypher, which I set down under the second Figure of the above-mention'd Product, and then I multiply the Multiplicand by the next Figure of the Multiplier, viz. (6 in the same Line) saying 6 times 4 is 24: I set down four next to the Cypher, in the same Line, and it stands under the third Figure in the last Product, just under its Multiplier 6, and I find this Product, to be 3042659040. Then coming to another Cypher, I set it down just under its own Place, and go forward with the next Figure, 5, in the same Line as before, saying, 5 times 4 is 20, &c. I set down the 0, just under 5 the Multiplier, and find the Product to be 2555549200. Then I come to another Cypher, and proceed as before, and find this last Line, or Product, 273439360. All which Products being added together, make 205410266767288, for Answer. See the foregoing Work.

More Examples.

$$\begin{array}{r} 7864371 \\ 20604 \\ \hline \end{array}$$

$$\begin{array}{r} 31457484 \\ 471862260 \\ 157287420 \\ \hline \end{array}$$

$$\begin{array}{r} 162037500084 \\ \hline \end{array}$$

$$\begin{array}{r} 327586 \\ 6030 \\ \hline \end{array}$$

$$\begin{array}{r} 9827580 \\ 19655160 \\ \hline \end{array}$$

$$\begin{array}{r} 1975343580 \\ \hline \end{array}$$

X. When there is a Cypher, or Cyphers, in the Multiplier towards the right Hand, then set it, or them, backward from the Place of Units, towards the right Hand, and multiply by the significant Figure, or Figures, as usual; and afterwards annex the Cypher, or Cyphers, to the general Product on the right Hand, as in the following Examples.

Examples.

Examples.

$$\begin{array}{r} 326 \\ 20 \\ \hline \end{array}$$

$$\begin{array}{r} 6520 \\ \hline \end{array}$$

$$\begin{array}{r} 746094 \\ 3600 \\ \hline \end{array}$$

$$\begin{array}{r} 4476564 \\ 2238282 \\ \hline \end{array}$$

$$\begin{array}{r} 2685938400 \\ \hline \end{array}$$

$$\begin{array}{r} 4762 \\ 70 \\ \hline \end{array}$$

$$\begin{array}{r} 333340 \\ \hline \end{array}$$

$$\begin{array}{r} 4796 \\ 400 \\ \hline \end{array}$$

$$\begin{array}{r} 1918200 \\ \hline \end{array}$$

$$\begin{array}{r} 72964 \\ 476000 \\ \hline \end{array}$$

$$\begin{array}{r} 437784 \\ 510748 \\ 291856 \\ \hline \end{array}$$

$$\begin{array}{r} 34730864000 \\ \hline \end{array}$$

XI. When there are Cyphers both in the Multiplicand and Multiplier, then omit the Cyphers in both, till you have multiplied by the significant Figures; and then join the Cyphers in each to the Product; as in these

Examples.

$$\begin{array}{r} 42600 \\ 220 \\ \hline \end{array}$$

$$\begin{array}{r} 852 \\ 852 \\ \hline \end{array}$$

$$\begin{array}{r} 9372000 \\ \hline \end{array}$$

$$\begin{array}{r} 429000 \\ 5600 \\ \hline \end{array}$$

$$\begin{array}{r} 2538 \\ 2115 \\ \hline \end{array}$$

$$\begin{array}{r} 2361800000 \\ \hline \end{array}$$

$$\begin{array}{r} 376400 \\ 2400 \\ \hline \end{array}$$

$$\begin{array}{r} 15056 \\ 7528 \\ \hline \end{array}$$

$$\begin{array}{r} 903360000 \\ \hline \end{array}$$

CONTRACTIONS.

Or, how to multiply by 10, 100, 1000, 10000, &c.

To multiply by $\left\{ \begin{array}{l} 10 \\ 100 \\ 1000 \\ 10000 \\ 100000 \end{array} \right\}$ Add to the Multiplicand $\left\{ \begin{array}{l} 0 \\ 00 \\ 000 \\ 0000 \\ 00000 \end{array} \right\}$

Example.

Example.

$$\begin{array}{r} 428 \\ \text{Multiplied} \\ \text{by} \end{array} \left\{ \begin{array}{l} 10 \\ 100 \\ 1000 \\ 10000 \\ 100000 \end{array} \right\} \text{ makes } \left\{ \begin{array}{l} 4280 \\ 42800 \\ 428000 \\ 4280000 \\ 42800000 \end{array} \right\}$$

If you would be expeditious and dextrous in *Accounts*, always to multiply by 11 and 12, that the Product may be in one Line only.

Examples.

Multiply	456	7890	3425
By	11	11	12
Product	5016	86790	37675

In the first of these, I say, 11 times 6 is 66, 6 and go 61 and 11 times 5 is 55, and 6 is 61, 1 and go 6; and 11 times 4 is 44, and 6 is 50, as above; and so of the rest.

Multiply	1234	56789	30762
By	12	12	12
Product	14808	681468	369144

Here I say, 12 times 4 is 48, 8 and carry 4; and 12 times 3 is 36, and 4 is 40, 0 and go 4, &c.

When any Number is to be multiplied by 5, it may be contracted by annexing a Cypher to the Number, and then halve it, because 5 is the Half of 10.

And the Rule holds good for Brevity if a Number is to be multiplied by 15. *Example, Multiply 567 by 15.*

$$\begin{array}{r} 5670 \\ \hline \frac{1}{2} 2835 \\ \text{By } 3 \text{ because } 3 \text{ times } 5 \text{ is } 15. \\ \hline 8505 \\ \hline \end{array}$$

When

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When you multiply by any of these compound Numbers, viz. 110, 120, 1100, or 1200, then multiply as before, and annex the Cyphers afterwards.

Example.

Mult.	3762	34567	46972	96726
By	110	120	1100	1200
Prod.	413820	4148040	51669200	116071200

Which Way of multiplying is much better than the following,

3762	Or thus,	34567
110		120
37620		691340
3762		34567
413820		4148040

XII. To multiply by Article Numbers, viz. 13, 14, 15, &c. to 20, to have the Work in one Line.

Examples.

74974	45678
13	18
974662	822204
Or Thus,	
74974	45678
224922	365424
974662	822204

RULE

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RULE for the first two Examples.

Multiply each Figure in the Multiplicand by the Unit Figure in the Multiplier, adding to each single Product the back Figure; and to the last Figure add what you carry.

As in the first Example, I say, 3 times 4 is 12, 2 and 1; and 3 times 7 is 21, and one carried is 22, and 4, the back Figure of the Multiplicand, is 26, 6 and go 2; 2 times 9 is 27, and 2 is 29, and 7, the back Figure, is 36, 6 and go 3; and 3 times 4 is 12, and 3 is 15, and 9, the back Figure, makes 24, 4 and carry 2; then 3 times 7 is 21, and 2 is 23, and 4, the back Figure, is 27, 7 and go 2, which 2 add to the last Figure 7, and it makes 9, as in the Work.

In the two last Examples, I multiply by the last Unit Figure of the Multiplier, and set the first Figure of the Product one Place forward to the right Hand.

XIII. To multiply by a *mixt Number*; that is a *Whole Number* joined with a *Fraction*, whether it be $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, or $\frac{1}{6}$.

The RULE.

When you have multiply'd by the whole Number, take the $\frac{1}{2}$, the $\frac{1}{3}$, the $\frac{1}{4}$, the $\frac{1}{5}$, or the $\frac{1}{6}$, of the Multiplicand, and add it to the Product, and that Total shall be the whole Product, as in the following Examples.

Example 1.

In 276 Barrels of Raisins,
Each 3 $\frac{1}{4}$ C. How many Hundred Weight?

328 the Product by 3.

69 the 4th part of the Multiplicand, 276.

Ans. 397 Hundreds Weight in all.

Example

Example 2.

In 756 Pieces of *Stuff*,
Each 24½ Yards, How many Yards?

3024
1512
378 The half of the *Multiplicand*, 756.

Answ. 18522 Yards in all.

Example 3.

In 63 Fodder of Lead,
Each 19½ C. How many Hundreds?

567
63
31½ the half of 63, the *Multiplicand*,

Answ. 1228½ Hundreds Weight in all.

If the Multiplier had been accounted Money, or 19s. 6d. and the Multiplicand 63 Integers, at that price, then the Product would have been 1228s. 6d. or 61l. 8s. 6d.

Example 4.

In 24 Casks of *Tobacco*,
Each 2¼ C. How many Hundreds?

48
12 The Half of 24.
6 The 4th Part of 24; or Half of 12.

Answ. 66 Hundreds in all.

'Twould have been the same, if I had said 24 pr. of *Stockings*, or any thing else, at 2s. ½, or 2s. 9d. (for 9d. is ¼ of a *Shilling*) then the Product would have been 66s. or 3l. 6s.

Example

Example 5.

At 224 French Crowns,
 $54\frac{1}{3}$ per Crown,

896
1120
74 $\frac{2}{3}$ The $\frac{1}{3}$ of 224, the *Multiplicand*;
Pence 12170 $\frac{2}{3}$

Example 6.

At 340 Grofs of *Past-Boards*,
 $7\frac{1}{5}$ d. per Grofs, Custom.

2380
68 The $\frac{1}{5}$ part of 340.

Prod. 2448 Pence.

This Method of multiplying by a mixt Number, is of excellent Use in a Multitude of Cases, particularly in Exchange of Money of different Nations.

XIV. I shall now shew the excellent Use of *Multiplication*, in answering all manner of Questions, that ordinarily occur in Business; where we have the *Price of one Thing*, and want to know the *Value of many Things* at that Rate; and shew that it performs the *Office*, and answers the *Work of Questions* in the *Rule of Three Direct*, of that Kind; but in a much conciser Method, and more elegant Manner; and that by such easy Rules and Directions, that any one, who understands *Addition of Money*, shall as readily cast up any thing this Way, as he shall in a Sum in that: For nothing is more required here, than to carry from one Denomination to the next, exactly as we do there; and therefore it may be truly said, That this *Rule*, performeth the Work of many *Additions*, as was hinted before.

Example

Example.

How much is 3 times	s. d.	
Or 3 Yards of Cloth, at	11 9	<i>Multiplicand.</i>
11s. 9d.	3	<i>Multiplier.</i>
	1. 1	15 3 <i>Pro. or Answer.</i>

The R U L E.

Observe always to multiply the *Price* by the *Quantity*, and the *Product* is the *Answer*.

Here I say, 3, times 9 is 27 Pence, which is 2s. and 3d. I set down 3 under the Place of Pence, and carry the 2s. to the Shillings; then 3 times 11 is 33, and 2 that I carry is 35s. which is 1l. 15s. I set down the 15s. under the Shillings place, and set down the 1l. a little forward to the left Hand; and so the *Question* is answered, and found to amount to 1l. 15s. 3d. as by the *Work* above. Now here is no more Difficulty than in *Addition*, it being the same in effect, and altogether as easy.

1. s. d.	If 11s. 9d. is three times set down as in
11 9	<i>Addition</i> , and cast up, it will prove the
11 9	same, as may be seen in the <i>Margin</i> ;
11 9	and is a sure Proof of the Truth of
	this Method.
1 15 3	

Example 2.

How much is 5 times 7s. 4d? or 5 Gallons of Brandy, at 7s. 4d.

	s. d.	
<i>Multiplicand,</i>	7 4	The price.
<i>Multiplier,</i>	5	The quantity.
<i>Product,</i>	1 16	8 Answer.

Here

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Here I say, 5 times 4 is 20 Pence, which is 1s. 8d. I set down 8 and carry 1, just as in *Addition of Money*, (and nothing more is required to be remembred, let the *Example* be what it will) and 5 times 7 is 35s. and 1 I carried is 36s. which is 1l. 16s. I set down the 16s. under the Place of Shillings, and the 1l. towards the left Hand, And the *Answer* is 1l. 16s 8d. as above.

Example 3.

What is 7 times 21d? Or 7 Stone of Beef.

	s.	d.	
At	—	—	1 9 Price.
			7
			—
	12	3	
			—

Here I say, 7 times 9 is 63d. that is 5s. 3d. set down 3, and carry 5, and 7 times 1 is 7, and 5 is 12; which makes 12s. 3d. for the *Answer*.

Example 4.

What comes 9lb of Tea to, at 9s. 9d $\frac{1}{2}$ per Pound?

	l.	s.	d.	qr.
	9	9	$\frac{1}{2}$	
				9
				—
	4	8	1	$\frac{1}{2}$
				—

I say here, 9 times 2 is 18, 18 Farthings is 4d. $\frac{1}{2}$, set down $\frac{1}{2}$, and carry 4; then 9 times 9 is 81, and 4 I carry 85 Pence, which is 7s. 1d. I set down 1, and carry 7; then 9 times 9 is 81, and 7 is 88 Shillings, which make 4l. 8s. I set down 8s. and the 4l. out to the left Hand, as before; and the *Answer* is 4l. 8s. 1d. $\frac{1}{2}$, as above.

E

Example.

Example 5.

What comes 10 times
Or, 10*lb.* of *Nutmegs* at 11*s.* 6*d.*

<i>l.</i>	<i>s.</i>	<i>d.</i>
	11	6 to?
		10
5	15	0

Here 10 times 6 is 60 Pence, which is just 5*s.* I set down 0, and carry 5, then 10 times 11 is 110, and 5 is 115 Shillings, which is 5*l.* 15*s.* for the *Answer*.

Example 6.

How much is 11 times, — — — 17 6
Or, 11 *Pistols* at *ditto*? 11

<i>l.</i> 9	12	6

I say here, 11 times 6 is 66 Pence, which is 5*s.* 6*d.* I set down 6 and carry 5; then 11 times 7 is 77, and 5 that I carry is 82, I set down 2 and carry 8; then 11 times 1 is 11, and 8 is 19; and as they are so many *Angels* (it being in the Tens of Shillings) I take the half of them, which is 9 or 9 Pounds, and Ten Shillings over, which I put to the left of the 2*s.* set down before, and they make 12*s.* and the 9*l.* I set at a proper Distance towards the left Hand, as in the *Example* may be seen.

Example 7.

What comes 12 *Sheep* to, at

<i>s.</i>	<i>d.</i>
13	4
	12
<i>l.</i> 8	00 0 <i>Ans.</i>

Note,

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11 Ounces of Silver at — — — $\begin{array}{r} l. \quad s. \quad d. \quad q. \\ 0 \quad 5 \quad 5 \quad \frac{1}{2} \\ 11 \end{array}$

10 Pipes of Wine, at *per Pipe* — — — $\begin{array}{r} \text{Answ.} \quad 3 \quad 0 \quad 0 \quad \frac{1}{2} \\ 24 \quad 15 \quad 0 \\ 10 \end{array}$

6 Yards of Flannel, at — — — $\begin{array}{r} \text{Answ.} \quad 247 \quad 10 \quad 0 \\ 1 \quad 2 \\ 6 \end{array}$

96. of Tallow, at — — — $\begin{array}{r} \text{Answ.} \quad 7 \quad 0 \\ 34 \quad 6 \\ 9 \end{array}$

Here the $\frac{1}{2}$ of 31 is 15 and a $\frac{1}{2}$ $\begin{array}{r} 15 \quad 10 \quad 6 \end{array}$

XV. When the Quantity exceeds 12, find two Numbers in the *Multiplication-Table*, which being multiplied together, will make the Quantity: then multiply the *Price* by one of the Numbers (it matters not which you multiply first by) and then that Product by the other Number, and the last Product will be the Answer.

Example 1.

What is 18 Times 4 6 Or 18
Gallons of Brandy, at 3 the 1st Multiplier.
4s. 6d. per Gallon. — — —

13 6 the 1st Product by 3.
6 the 2d Multiplier.

Answ. 4 01 0 the last Product by 6.

Here

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Here I find this Quantity two Ways (as many times it happens) *viz.* either by 3 and by 6, or by 2 and by 9; either of them multiplied together make the Quantity, *viz.* 18

$$\begin{array}{r}
 \text{l. s. d.} \\
 4 \quad 6 \\
 \quad 2 \\
 \hline
 9 \quad 0 \\
 \quad 9 \\
 \hline
 4 \quad 1 \quad 0 \\
 \hline
 \end{array}$$

Here is the Answer produced by 2 and 9, as above.

Example 2.

How much is 32 times	15	9 $\frac{1}{2}$
Or, 32lb. of Tea, at 15s.		4
9d. $\frac{1}{2}$ per Pound.		
The first Product by 4.	3	03 2
The Second Multiplier		8
Answer	25	05 4

Here the Numbers are 4 and 8; 4 times 8 making 32, the Quantity; wherefore I begin, and say, 4 times 2 is 8 Farthings, which being just Two Pence, I carry it to the Pence; then 4 times 9 is 36, and 2 is 38 Pence, which is 3s. and 2d. I set down 2 and carry 3s. &c. After I have multiplied by 4, I find that Product to be 3l. 3s. 2d. which I multiply by 8, the other Number, and find the last Product, or Answer, to be 25l. 5s. 4d. as in the Work may be seen.

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What is 120 times,
Or 120 Quarters of
Corn, at 19s. 8d. per,
Quarter?

<i>l.</i>	<i>s.</i>	<i>d.</i>
	19	8
		10
9	16	8
		12

Answ. 118 00 0

Here 10 times 12 makes 120 the Quantity; wherefore I multiply first by 10, and that Product is 9*l.* 16*s.* 8*d.* which I multiply by the other Number 12, and that produces 118*l.* for the Answer.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
77 <i>C.</i> of Madder, at — — —	3	15	6
			7
	26	08	6
			11

Answ. 290 13 6

Here 11 times 7 makes the Quantity; when I come to multiply by the second Multiplier, viz. 11, I say 11 times 6 is 66, which is 5*s.* 6*d.* I set down 6, and carry 5; then 11 times 8 is 88, and 5 is 93*s.* which is 4*l.* 13*s.* I set down 13 and carry 4; and then 11 times 6 is 66, and 4 is 70, I set down 0, and carry 7 for the Tens; and then 11 times 2 is 22, and 7 is 29, &c.

More Examples.

15 Yards of Ribbon, at — — —	2	1
		3
	6	3
		5

Here 3 times 5 is 15, the Quantity

Answ. 1 11 3
21 Yards

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21 Yards of *Tabby*, at — — — — — $\begin{array}{r} l. \quad s. \quad d. \\ 5 \quad 11 \quad 7 \end{array}$

Here 7 times 3 is 21

$\begin{array}{r} 2 \quad 01 \quad 5 \\ 3 \end{array}$

Answ. $\begin{array}{r} 6 \quad 04 \quad 3 \end{array}$

72 Gallons of *Wine*, at

$\begin{array}{r} 5 \quad 4 \quad 6 \end{array}$

Here 6 times 12 makes the Quantity, or 8 times 9 makes 72 likewise.

$\begin{array}{r} 1 \quad 12 \quad 0 \\ 12 \end{array}$

Answ. $\begin{array}{r} 19 \quad 04 \quad 0 \end{array}$

81lb. of *Nutmegs*, at — — —

$\begin{array}{r} l. \quad s. \quad d. \quad q. \\ 12 \quad 3 \quad \frac{1}{4} \quad 9 \end{array}$

Here 9 times 9 makes the Quantity.

$\begin{array}{r} 5 \quad 10 \quad 9 \quad \frac{1}{4} \quad 9 \end{array}$

Answ. $\begin{array}{r} 49 \quad 17 \quad 3 \quad \frac{1}{4} \end{array}$

XVI. When the Quantity is such a Number, that no two Numbers in the Table can be found to answer it, then multiply by two such Numbers as come nearest to the Number given, as before; and for the Number wanting to make up the Number given, multiply the Price of one by the Number that is wanting, and add it to the other Product, and the Total will be the Answer.

E 4.

Example

Example 1.

			<i>l.</i>	<i>s.</i>	<i>d.</i>
39 C. of Currants, at per, C.	—	—	2	13	6
					6
			16	01	0
					6
The Price 2 <i>l.</i> 13 <i>s.</i> 6 <i>d.</i> }	multiplied by 3. }		96	06	0
			8	00	6
		Ans.	104	06	6

Here I find the two Numbers that come the nearest are 6 times 6, by which I multiply as before, and the last Product is 96*l.* 6*s.* 0*d.* but 6 times 6 is but 36, and the Quantity is 39, so that there is 3*C.* wanting; wherefore I multiply the Price 2*l.* 13*s.* 6*d.* by 3, and it produces 8*l.* 00*s.* 6*d.* to be added to the last Product, 96*l.* 06*s.* 0*d.* which together makes 104*l.* 06*s.* 6*d.* for the Answer.

			<i>l.</i>	<i>s.</i>	<i>d.</i>
79 Firkins of Butter, at	—	—	00	17	6
					7
			6	02	6
					11

Here the two Numbers that come nearest, are 7 times 11, which is 77.
The Price multiplied by (2) that are wanting.

			<i>l.</i>	<i>s.</i>	<i>d.</i>
			67	07	6
			01	15	0
		Ans.	69	02	6

More

More Examples.

57 Gros of Pipes, at per Gros — — 1 4

7

09 4

8

03 14 8

1 Gros wanting. 00 01 4

Answ. 03 16 0

76C. $\frac{3}{4}$ of Ship-Bisket, at — — — l. s. d. q.

13 6 6

4 01 0

12

48 12 0

The Price multiplied by 4

02 14 0

The $\frac{1}{2}$ 13s. 6d. for the $\frac{1}{2}$ C.

00 6 9

The $\frac{1}{4}$ of ditto for the $\frac{1}{4}$ C.

00 3 4 $\frac{1}{2}$

Answ. 51 16 1 $\frac{1}{2}$

87 Ells of Holland, at
Here 7 times 12 is 84, and 3 is 87

3 5 $\frac{1}{2}$

7

1 04 2 $\frac{1}{2}$

12

14 10 6

10 4 $\frac{1}{2}$

The Price multiplied by 3.

Answ. 15 00 10 $\frac{1}{2}$

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If I had multiplied by 11 times 8, which is 88, and subtracted the Price of 1 from the Product, the Remainder would have been the Answer, as before.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
97 <i>C.</i> $\frac{1}{2}$ of <i>Cheese</i> , at <i>per C.</i>	25	6	8
	10	04	0
			12
For the 1 <i>C.</i> wanting	122	08	0
The Half of the Price for the $\frac{1}{2}$ <i>C.</i>	1	05	6
		12	9
Ans ^r .	124	06	3

Thus by the various *Examples* foregoing, is manifestly seen, that when the Price of one thing is given, the Price of many (at the same Rate) may be found by *Multiplication* only; and sooner, and much handsomer than by the *Rule of Three*.

Large Sums may be cast up this Way, as well as small, observing the Directions following.

When your Sum is 1, 2, 3, 4, or more Hundreds, always multiply the Price by 10, and then that Product by 10 also, which produces the Value of one Hundred; then multiply that Product by the Number of Hundreds, whether 2, 3, 4, or 5, &c. and that Product is the Value of so many Hundreds as there are; then for the Tens, whether 20, 30, 40, &c. multiply that Product which gives the Price of 10, either by 2, 3, 4, or 5, as the Tens shall happen, which place under the last Product, without drawing a Line; and for the Units always multiply the Price by them, whether 2, 3, 4, &c. and set that also just under the former Products so that you will have three Lines to add together, and the Total of them is always the Answer. An *Example*, or two, will make it easy to be understood.

Example

Example 1.

What is 648 times Or 648 <i>lb.</i> of <i>Indigo</i> , at <i>ditto</i> ?	<i>l.</i>	<i>s.</i>	<i>d.</i>
		4	6
			10
The Value of (10)	2	05	0
			10
The Value of (100)	22	10	0
The Number of Hundreds			6
The Value of (600)	135	00	0 600
The Price of (10) mult. by (4)	9	00	0 40
The Price multiplied by (8)	1	16	0 8
	Anfw. 145	16	0 648

First I multiply 4*s.* 6*d.* the Price by 10, and that produces 2*l.* 5*s.* for the Price of 10; also I multiply the said 2*l.* 5*s.* the Price of 10, by 10 again, and that produces 22*l.* 10*s.* for the Value of 100, then I multiply the Value of 100 by 6, the Number of Hundreds, and that Product is the Value of 600, being 135*l.* 00*s.* 00*d.* wherefore I am only now to find out the Value of 48: For the 4 Tens in 48, I multiply the Price of 10, *viz.* 2*l.* 05*s.* 0*d.*, by 4, and that Product shews the Value of 40, which is 9*l.* Then for the 8 Units in the 48, I multiply the first Price, *viz.* 4*s.* 6*d.* and that Product gives the Value of 8, which is 1*l.* 16*s.* All which being added together, (that is only the three Lines that have no Line of Separation between them) make 145*l.* 16*s.* 0*d.* for Answer.

And thus may any Sum be done, let it be as large as it will, only when the Sum consists of Thousands, you have 4 Lines to add together, but when but of Hundreds, only three.

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Example 2.

355 Ells of Holland, at — —	2	3	$\frac{1}{2}$	
			10	
The Value of (10)	1	02	11	
			10	
The Value of (100)	11	09	2	
			3	
The Value of (300)	34	07	6	300
The Value of 10 mult. by (5)	5	14	7	50
The Price by 5 Units	0	11	$5\frac{1}{2}$	5
Answ.	40	13	$6\frac{1}{2}$	355

Example 3.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	
966lb. Pound of Bohca Tea, at —		14	5	
			10	
The Value of (10)	7	04	2	
			10	
<i>ditto</i> of (100)	72	01	8	
The Number of Hundreds			9	
The Value of (900)	648	15	0	900
The Value of 10 mult. by (6)	43	05	0	60
The Price of 1 mult. by (6)	4	06	6	6
Answ.	696	06	6	966

Example

Example 4.

8954 Gall. of Rum, at	—	—	l.	s.	d.
				03	5
					10
The Price of (10)			1	14	2
					10
			17	01	8
					10
The Price of (1000)	170	16		8	
The Number of Thousands					8
The Value of (8000)	1366	13	4	8000	
The Value of (100) mult. by 9	153	16	0	900	
The Value of 10 mult. by 5,	8	10	10	50	
The Price mult. by 4 Units,	0	13	8	4	
Answ. 1529 12 10 8954					

I have insisted the longer on this excellent Method, that it might be well understood; not only for its elegant, expeditious, and facile Dispatch of ordinary Affairs; but for its Utility in contracting many Operations in other Rules, as the *Rule of Three*, &c.

I know it is not customary to introduce any thing of this Kind to be learnt so early; imagining (it may be) the Scholar not capable of understanding them, 'till he has made farther Advances in *Arithmetic*; but since they are only *Multiplication*, the foregoing Methods properly belong to the *Rule*, and may well be taught in it, especially since they are of such excellent Use in all manner of Business, and may be of Service to some, whose Leisure or Ability admit not of larger Improvements in *Arithmetic*.

Quantities

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Quantities of Weight, Measure, &c. are expeditiously found by this Method of multiplying by component Parts.

Examples.

In 64 Barrels of *Anchovies*, each
how many Pounds; Multiply by $30\frac{1}{2}$ lb.
8 and 8

Answ. 1952

In 56 Firkins of *Butter*, each
how many Pounds? Multiply by 56 lb.
7 and 8

Answ. 3136

In 98 Casks of *Capers*, each
how many Hundreds, &c? $C. \text{ qrs. } lb.$
3 3 14
10, 9, and 8

Answ. 379 3 0

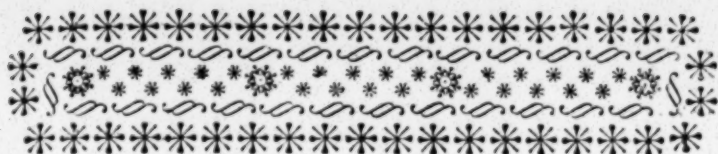
In 104 Bars of *Spanish Silver*, each
How many Oz. $46\frac{1}{4}$ oz.
10, 10 and 4

Answ. 4810 Ounces.

In 48 Packs of *Linnen*, each
how many Ells Flemish? Mult. by 4225 Ells *Flem.*
6 and 8

Answ. 202800

I might here also shew the Method of *Cross Multiplication*; or multiplying *Shillings* and *Pence*, by *Shillings* and *Pence*; or *Feet* and *Inches*, by *Feet* and *Inches* (it being all one) and some other Methods in *Practical Multiplication*; but there being too much of *Division* used with them, I shall defer them till I come to another Place.



C H A P. V.

D I V I S I O N.

I. **I**S a *Rule* by which we discover how often one Number is contained in another; as if it were asked, How often is 8 contained in 48, the Answer would be 6 times. It likewise serveth to bring small Denominations into greater; as *Farthings* into *Pounds*, and *Pounds Weight* into *Tuns Weight*, &c.

II. This *Rule* is comprehended under Three certain Branches, and One uncertain, *viz.*

1. The *Dividend*, or Number given to be divided.
2. The *Divisor*, or Number given to divide by.
- 3 The *Quotient* or Number of equal Parts, shewing how often the *Divisor* is contained in the *Dividend*.
- 4 The *Remainder*, after the Work is ended; which is always of the same Name or Quality with the *Dividend*; and must be less than the *Divisor*, if the Work be right: And this is the uncertain Branch, because there is sometimes a *Remainder* and sometimes not.

III. *Division* is either Single or compound. Single when the *Divisor* consisteth of one Figure only, and the *Dividend* of two at the least. Any thing of this Kind is answered by the *Multiplication-Table*; as if 54 were to be divided by 6, the Answer would be 9; for 6 is contained 9 times in 54: Here 54 is the *Dividend*; 6 the *Divisor*; and 9 is the *Quotient*, or Answer.

IV.

IV. *Compound Division* is when the *Dividend* consisteth of many Places or Figures, and the *Divisor* of one or more Figures. As if 365, the Days in a Year, were to be divided by 7, the Days in a Week; 365 is the *Dividend*; 7 the *Divisor*, 52 the *Quotient*, and 1 the *Remainder*.

$$\begin{array}{r}
 \text{Dividend} \\
 \text{Divisor } 7 \overline{)365} \text{ } 52 \text{ Quotient.} \\
 \underline{35} \\
 15 \\
 \underline{14} \\
 1 \text{ Remainder.}
 \end{array}$$

A General RULE for the Working.

N. B. $\left\{ \begin{array}{l} 1 \text{ Seek,} \\ 2 \text{ Multiply,} \\ 3 \text{ Subtract.} \end{array} \right.$

This *Rule* comprehends Three of those foregoing: and is accounted the hardest Lesson of *Arithmetic*; but I shall, by plain *Rules*, and familiar *Examples*, render it easy to the meanest Capacity. And as in *Multiplication*, so in this *Rule*, I shall endeavour at some new Improvements; discovering that many Things in this *Rule* may be abridged and shew its excellent Use in answering many Questions, which seem to require a more progressive Knowledge in *Arithmetic*.

Example 1.

Let it be required to divide 7420 by 5; in order to which, I place my *Dividend*, or Sum to be divided, into 5 equal Parts, or Shares, thus 7 4 2 0. Then I place my *Divisor* 5. before the *Dividend*, with a crooked Line before it, and a strait Line drawn underneath it thus:

$$\begin{array}{r}
 5 \overline{)7420} \\
 \hline
 \end{array}$$

Then

Then I Proceed according to the *Rule*: And first I *seek*, saying, How many times 5, the *Divisor*, can I have in 7, the first Figure of the *Dividend*, and the Answer is once, which I place under the Line just under the 7; then according to the *Rule*, I multiply, saying once 5, (the *Divisor*) is 5; then as the *Rule* Directs I subtract, saying, 5 from 7, and there remains 2, which are two Tens, which I suppose to stand before the next Figure in the *Dividend*, viz. 4, and so makes it 24,

$$\begin{array}{r} 5 \overline{)7420} \\ \hline \end{array}$$

I

for a new *Dividual*. Then again I *seek*, saying, How many times 5, (the *Divisor*,) can I have in 24, the *Dividual*? And the Answer is 4 times, which I place under the Line, just under 4 the second Figure, in the *Dividend*, then I multiply, saying, 4 times 5 the *Divisor*, is 20, which I subtract from 24, and there rests 4, which being 4 Tens, makes the next Figure 2, in the *Dividend*, to be 42. Then again I *seek* how many times 5 I can have in 42, and the Answer is 8 times, which I put under the Line, just under 2, the third Figure in the *Dividend*; then I multiply, saying, 8 times 5 is 40, which I subtract from 42, and there remains 2, which two Tens make the Cypher in the *Dividend*, to be 20, then I say how many times 5, the *Divisor*, in 20, and the Answer is 4 times; then 4 times 5 (the *Divisor*,) is 20, from 20, and there remains nothing. And so the Work is done; as by the following *Example*.

Divisor 5)7420(*Dividend*

1484 *Quotient*, or Answer.

So that I find by the Work, that 5 is contained in 7420 just 1484 times: Or if the *Dividend* had been so many *Shillings* or *Pounds*, to be parted among 5 Persons, each Person must have had so many *Shillings* or *Pounds*, for his Share.

V. When the Figure of your *Dividend* is leſſer than the *Diviſor*, or firſt Figure of your *Diviſor* then make the two firſt Figures of the *Dividend*, your *Dividual*, and work as before.

Example.

Divide 4263 Gallons of *Wine* among 7 Perſons : Having ſet down the *Dividend* for the Work as before, with the *Diviſor* before it, thus,

$$\begin{array}{r} 7 \overline{)4263} \text{ (Dividend.} \\ \underline{609} \text{ Quotient.} \end{array}$$

I proceed, ſaying, How many times 7, (the *Diviſor*,) can I have in 4, the firſt Figure of the *Dividend*; and knowing I cannot take 7 out of 4, I take it out of 42, the two firſt Figures of the *Dividend*; and the Answer is 6 times, which I put juſt under 2, the ſecond Figure of the *Dividend*, and then multiply, ſaying 6 times 7, (the *Diviſor*,) is 42, from 42, and there remains nothing. Then the Sevens that are in 6 (for you muſt never take more than one Figure or Cypher, at a time, out of the *Dividend*, except you are obliged to do it at firſt) I cannot take, wherefore I put a Cypher in the *Quotient*, under 6, and 6 remains as ſo many Tens, and makes the next or laſt Figure in the *Dividend* 3, to be 63; then the Sevens in 63, 9 times and the Work is done; and the *Quotient* is 609, or 609 Gallons for each Man's Share.

The P R O O F.

To prove this, or any other Sum in *Diviſion*, multiply the *Quotient* by the *Diviſor*, and if the *Product* is like the *Dividend*, the Work is right: But obſerve, whenever there is a *Remainder*, ſuch *Remainder* muſt be taken in, or added to the *Product*.

Example

Example.

$$\begin{array}{r}
 7 \overline{)4263} \\
 \underline{609} \\
 7 \\
 \underline{4263} \text{ Proof.}
 \end{array}$$

Here I say, 7 times 9 is 63, 3 and carry 6, then 7 times 0 is nothing, but 6 is 6; lastly, 7 times 6 is 42; so that I find this *Product* to be the very same Figures with the *Dividend*; therefore the Work is right.

So likewise as *Multiplication* proves *Division*, doth *Division* prove *Multiplication*. For if you divide the *Product* by the *Multiplier*, the *Quotient*, (if the Work is right) will be the same with the *Multiplicand*. As thus:

In proving the last Sum, 609 is the *Multiplicand*, and 4263 is the *Product*, and 7 the *Multiplier*. Now if the *Product* 4264 be divided by 7 the *Multiplier*, the *Quotient* will be 609 the *Multiplicand*, as may be seen in the foregoing Work.

Example.

Divide 97961 Pieces of 8 among 9 Men.

$$\begin{array}{r}
 9 \overline{)97961} \\
 \underline{10884\frac{5}{9}} \text{ Answ.} \\
 \underline{97961} \text{ Proof.}
 \end{array}$$

Here

Here I say, the Nines in 9, once; which I put under the Line, just under 9 in the *Dividend*, and then I multiply, saying once 9 from 9, and there remains nothing; then the Nines in 7, none; wherefore I set down an 0 in the *Quotient*, just under 7, and the 7 remains, and makes the next Figure 9 in the *Dividend*, to be 79; then the Nines in 79, are 8, then 8 times 9 is 72, from 79, and there rests 7, which makes the next Figure 6, in the *Dividend*, to be 76; then the Nines in 76 are 8; 8 times 9 is 72, from 76, and there rests 4, which makes the next and last Figure in the *Dividend* to be 41; then the Nines in 41 are 4; 4 times 9 is 36, from 41, and there rests 5, which is the *Remainder*; and may be set at some small Distance from the *Quotient*, towards the right Hand, with the *Divisor* 9 under it, thus $\frac{5}{9}$. So that there are 5 Parts of 9 over, besides 10884, that comes to each Man's Share, and is called a *Fraction*, and signifies that each Person ought to have 5 Ninths of a *Piece of Eight* more to his Share.

What hath been already said for Instruction, to divide by a single Figure, I think sufficient to any intelligent Person; and therefore shall only add some *Examples* for the Learner's Practice, and so proceed forward in the Rule.

Examples for Practice.

$$\text{Divisor } 6 \overline{)9654}$$

$$\text{Quotient } \underline{\underline{1609}}$$

$$7 \overline{)4702}$$

$$\underline{\underline{671\frac{5}{7}}}$$

$$5 \overline{)44044}$$

$$\underline{\underline{8808\frac{4}{5} \text{ Rem.}}}$$

$$4 \overline{)57802}$$

$$\underline{\underline{14450\frac{2}{4}}}$$

$$9 \overline{)345678}$$

$$\underline{\underline{38408\frac{6}{9}}}$$

$$6 \overline{)407060}$$

$$\underline{\underline{67843\frac{2}{6}}}$$

Divisor,

<i>Divisor</i>	7)89012	8)98765	9)4567097
<i>Quot.</i>	12716 7	12345 ⁵ / ₈ 8	507455 ² / ₉ 9
<i>Proof.</i>	89012	98765	4567097

Note, There can be no shorter Way, nor a more regular Method of dividing by a single Figure, than by the Examples following.

As in *Multiplication*, we multiply by 11 and 12 at once, to have the Product in one Line, so in this Rule 'tis most expeditious and commendable to divide by the abovementioned Numbers, as by a single Figure, as in the following *Example*.

By	11)45678	11)379600
<i>Quotient</i>	4152 ⁶ / ₁₁	34509 ⁶ / ₁₁
By	12)42697	12)3967040
<i>Quotient</i>	3558 ¹ / ₁₂ 12	330586 ⁸ / ₁₂ 12
<i>Proof</i>	42697	3967040

In the first *Example*, I say, The Elevens in 45, 4 times; the Elevens in 16, once; the Elevens in 57, 5 times: the Elevens in 28 twice, and there remains 6; and the *Quotient* is 4152; as by the *Example*.

In the third *Example*, where I divide by 12 I say, the Twelves in 42, 3 times; the Twelves in 66, 5 times; the Twelves in 97, 8 times, and there remains 1; and the *Quotient* is 3558; as by the *Example*.

In

In like Manner you may divide by these Numbers, viz. 110 120, or 1100, or 1200, &c. cutting off the Cypher or Cyphers, with a downright Stroke of the Pen; and also as many Figures, or Cyphers, towards the right Hand, in the *Dividend*, which will be the Remainder, or Part of it, as in the following

Examples.

Divide by 11|0)8079|4

Quotient 736¹⁴₁₀
Divisor 110

Proof. 80974

12|00)2880|00

240

VI. *Contractions*, or how to divide by 10, 100, 1000, or 10000, &c. So many Cyphers as you have in your *Divisor*, cut off with a Stroke so many Figures, or Cyphers, from your *Dividend*, from the right Hand towards the left; and the Work is done. The Figures on the left Hand of the Stroke is the *Quotient*; and those on the right the *Remainder*; as in these *Examples*.

Q. R.
1|0)36|5
10

Q. R.
1|00)749|60
100

Q. R.
1|000)567|890
1000

Quot.
1|0000)7496|4600 Remains

VII. When the *Divisor* consists of several Figures, then arises the greatest Difficulty in the Work of *Division*; but I shall give such plain Directions, which, if heedfully attended, and observed, will render it very easy,

Example

Example 1.

Let it be requir'd to divide 78901 by 32. In order to the Work, I place the Numbers down with two crooked Lines, one behind the *Divisor*, and the other before the *Quotient*; thus:

$$\begin{array}{r} \text{Divid. Quotient.} \\ \text{Divisor } 32)78901(\end{array}$$

Then I set out as many Figures towards the left Hand of the *Dividend*, as their Places in the *Divisor*, by making a *Point* under 8, as above; then remembering the *General Rule*, viz. to *Seek Multiply* and Subtract, I begin saying, how many times 3, the first Figure of the *Divisor*, can I have in 7, the first Figure in the *Dividend*, and the Answer is twice; wherefore I set down 2 in the *Quotient*, thus, 32)78901(2 Then according to Rule, I multiply the *Divisor* 32, by 2, the times I take saying, twice 2 is 4, which I set down under 8 in the *Dividend*; then twice 3 is 6, which I place under 7 in the *Dividend*; then I draw a Line; and, according to the Rule, subtract 64 from 78 and there remains 14: as in the first Step of the Work may be seen, standing thus:

$$\begin{array}{r} 32)78901(2 \\ \quad 64 \\ \hline \quad 14 \end{array}$$

Then I make a *Point* under the next Figure, to wit, 9, and bring it down, setting it on the right Hand of the *Remainder* 14; and then there is 149 for a new *Dividend*, and stands thus:

$$32)78901(2$$

$$32)78901(2$$

...

64

 149

Then again I seek how oft I can have 32, the *Divisor*, in 149 the *Dividual*; but since that is too hard to reach by the Mind, there being one Figure more in the *Dividual* than in the *Divisor* (for there never ought to be more than one) I seek how often I can have 3, the first Figure of the *Divisor*, in 14, the two first Figures in the *Dividual*, and I find I can have 4 times; wherefore I put 4 in the *Quotient*, and multiply the *Divisor* 32, by 4, the Figure placed in the *Quotient*, saying 4 times 2 is 8, which I set under 9; then 4 times 3 is 12, which I put under 14, and then subtract 128 from 149, and there remains 21; (*Note*, After any *Subtraction*, there must never remain so much as the *Divisor*, for if there doth, you have made an Error, by taking a Time too little, which must be rectified, before you proceed any farther) then I make a Point under the next Place in the *Dividend*, which is a Cypher, and bringing it down, set it on the right of the Remainder 21, and it makes 210, for a *Dividend*; and after this second Step, the Work stands thus:

$$32)78901(24$$

...

64

149

128

210

Then again I seek how oft I can have 32 the *Divisor* in 210, or how oft (because there is one Figure more in the *Dividual*, than in the *Divisor*) I can have 3, the first in the

the Divisor, out of 21, the two first Figures in the Dividual, and the Answer is 7 times : But I must observe, not to take the first Figure any more times than I can the next. Wherefore I try if I can take all the Figures 7 times, by multiplying 32 the Divisor, by 7, and note its Product on Paper, or in my Mind, only by observing the two last Figures, whether it be not too big to subtract from the Dividual, and find it is, for I cannot take 224 (the Product of 32 by 7) out of 210 the Dividual, wherefore I take a time less, *viz.* but 6, and put that in the Quotient, and say, 6 times 2 is 12, 2 and carry 1, and 6 times 3 is 18, and 1 is 19, and then I have 192 to take out of 210, and there rests 18. Then I make a Point under the last Figure of the Dividend, 1, and bring it down to the Remainder 18, and it makes 181, and the Work stands thus :

$$\begin{array}{r}
 32)78901(246 \\
 \quad \dots \\
 \quad 64 \\
 \hline
 \quad 149 \\
 \quad 128 \\
 \hline
 \quad 210 \\
 \quad 192 \\
 \hline
 \quad 181
 \end{array}$$

Then I seek how often I can have 32, out of 181, or how often 3 in 18, and the Answer is 6 times ; but on Trial 1 find it too much ; and therefore I take but 5 times, and set 5 in the Quotient, and multiply the Divisor 32 by 5, and find that Product is 160, to be subtracted from 181, and the Remainder is 21, and so the Work is finished, and the Quotient is 2465, and the Remainder 21 ; which shews that 32 is contained in 78901, 2465 times, and 21 over. *See the Work.*

F

Dividend

Dividend
 Divisor, 32)78901(2465 Quotient

64

149
 128

210
 192

181
 160

(21) Remainder.

Example 2.

Divide 16790 Days by 365.

Quotient.

365)16790(46 Years.

1460

2190
 2190

(0)

In the *Example* above, I find I cannot take the first Figure of the Divisor out of the Dividend; wherefore I say, How oft 3 in 16? Upon Trial, I find 5 times too much, wherefore I set down 4 in the Quotient, and say 4 times 5 is 20, I set down 0 under 9, in the Dividend, and carry 2, saying 4 times 6 is 24, and 2 is 26, 6 and carry 2; then 4 times 3 is 12, and 2 is 14; which Product of 1460 I subtract out of the Dividend 1679, and there remains 219, to which I set down the Cypher out of the Dividend, and it makes 2190 for a Dividend, &c. See the Work above.

Example

Example 3.

Divide 345678901 by 2345. In order to the Work, I set it down thus:

$$2345)345678901($$

In this Sum are four Places in the Divisor, wherefore I make a Point under the 4th Figure in the Dividend, *viz.* under 6, for my first Dividual; but if the first Figure in the Divisor had been bigger than the first in the Dividend, then I must have made the Point under the 5th Figure in the Dividend, to wit, under the 7; and then have tried how oft the first Figure in the Divisor could have been taken out of the two first Figures in the Dividend.

But to proceed, I first seek how oft I can have 2, the first Figure of the Divisor, out of 3, the first of the Dividend, which is once, wherefore I put 1 in the Quotient, and multiply the Divisor 2345 by 1, setting the Product just under the first Dividual, and subtract according to Rule, and then the Work stands thus:

$$\begin{array}{r} 2345)345678901(1 \\ \underline{2345} \\ \text{IIII} \end{array}$$

Note, You must never bring down more than one Figure or Cypher at a time out of the Dividend, and for every Figure or Cypher brought down, there must be one, or a Cypher put in the Quotient.

Then I make a Point under the next Figure in the Dividend, *viz.* 7, and bring it down, placing it on the Right of the Remainder IIII, and then I have IIII7 for a Dividual, which contains one Figure more than the Divisor; wherefore I take the first Figure of the Divisor out of the two first Figures of

F 2

the

the first
where-
rial, I
n 4 in
et down
aying 4
then 4
of 1460
here re-
r out of
ual, &c.

Example

the Divisor out of the two first Figures of the Dividual, viz. 2 out of 11, saying, the Two's in 11, 5 times; but on Tryal I find I cannot take 5 times thro' the whole Divisor; for when I multiply the Divisor by 5, I find the Product to be 11725, which cannot be taken out of 11117, that is I cannot take 117 out of 111, wherefore I take one less, and set 4 in the Quotient, by which I multiply the Divisor 2345, and find its Product 9380, which subtracted from 11117, leaves 1737 for the Remainder; to which I bring down the next Figure of the Dividend, viz. 8, and annex it on the right Hand, and then there is 17378 for a Dividual, and the Work stands thus:

2345)345678901(14

...
 2345

 11117
 9380

 17378

Then I seek how oft I can have 2 in 17, and the Answer is 8 times, but on trial I find it too much, wherefore I set 7 in the Quotient.

Note in general, *When you are upon Trial for the times you can take, you need only mind the two last Figures of the Product towards the left Hand; for if you can take them out of the two first of the Dividual, it will most commonly bear the Times you take.*

Having set 7 in the Quotient, I multiply the Divisor by it, and the Product is 16415, which I subtract from 17378, and the Remainder is 963; to which I bring down the next Figure in the Dividend, viz. 9, and then I have 9639 for a Dividual, and then the Work will appear as follows.

2345)

2345)345678901(147

...

2345

11117

9380

17378

16415

9639

Here this last Dividual hath an equal Number of Figures with the Divisor, *viz.* Four; wherefore I seek how often I can have 2, the first Figure of the Divisor out of 9, the First of the Dividual, and the Answer is 4 times, which I put in the Quotient, and then multiply the Divisor by it, and the Product is 9380, which subtracted from 9639, the Remainder is 259, to which I bring down the Cypher, the next Place in the Dividend, and then I have 2590 for a Dividual; then I seek again, and set 1 in the Quotient, by which I multiply the Divisor, and subtract according to Rule, and the Remainder is 245, to which I bring down the last Figure out of the Dividend, *viz.* 1 and then there is 2451 for the last Dividual, and then I seek again, and I find I can take but once, wherefore I set another 1 in the Quotient, and work as before; and I find the Remainder 106, and so the Work is finished, as by the whole Operation in the following Page.

The P R O O F.

To prove the following Sum, or any other Sums in this *Rule*, multiply the Quotient by the Divisor, and if there be a Remainder, it must be taken in as you multiply; and if the Product is like the Dividend, the Work is right, as may also be seen in the *Example*.

F 3.

2345)

2345)

2345)345678901

.....

2345

11117

9380

17378

16415

9639

9380

2590

2345

2451

2345

(106) Remainder.

147411

2345

737061

589644

442234

294822

(345678901 Proof.

$$\begin{array}{r} 7 \\ 5 \times 0 \\ 7 \end{array} \} \text{Proof.}$$

In proving (after I have set the Divisor under the Quotient as in the *Example*) I say 5 times 1 is 5, and 6 that remains in the Units Place of the Remainder, is 11, 1 and carry 1, &c. When I come to the third Figure in the Multiplier, I take in the 1 that stands in the Place of Hundreds in the Remainder, as 3 times 1 is 3, and 1 is 4, &c.

Division may also be proved by the Cross, as in *Multiplication*: For Tryal, let us prove the foregoing Sum thus.

First cast the Nines out of the Divisor, and there remains 5, which I place on the left of the Cross (as you see in the Margin) then out of the Quotient, and there remains 0, which I set on the right of the Cross; then I multiply these two together, and they make 0; but the Nines must have been cast out there also, if by multiplying

plying them together they had made any, and what was over carried to the *Remainder*, which here makes 7, which I set on the Top, as in the Margin. Lastly, I cast away the Nines out of the Dividend, and there rests 7, also, which I put underneath the Cross, and finding the Top and Bottom Figures to be alike, I conclude the Work is right.

The foregoing Directions to the preceeding *Examples*, are so plain and easy, that there is no Occasion for any more; so I shall set down some more *Examples* without any verbal Directions, thinking what hath been already said to that Purpose to be sufficient.

More Examples.

Divisor 14)5873456(*419532 Quotient.*

$$\begin{array}{r}
 \begin{array}{c} 2 \\ 5 \end{array} \overline{)X} \begin{array}{c} 6 \\ 2 \end{array} \\
 \begin{array}{r}
 56 \\
 \hline
 27 \\
 14 \\
 \hline
 133 \\
 126 \\
 \hline
 74 \\
 70 \\
 \hline
 45 \\
 42 \\
 \hline
 36 \\
 28 \\
 \hline
 \end{array} \\
 \text{Remainder} \quad (8)
 \end{array}$$

$$\begin{array}{r}
 47)27072329(576007 \\
 \begin{array}{r}
 235 \\
 \hline
 357 \\
 329 \\
 \hline
 282 \\
 282 \\
 \hline
 329 \\
 329 \\
 \hline
 \end{array} \\
 \text{(0) Remainder.}
 \end{array}$$

Divisor 426(7890123(18521

$$\begin{array}{r}
 \begin{array}{c} 3 \\ 3 \end{array} \overline{) 7890123} \\
 \underline{3630} \\
 2221 \\
 \underline{2130} \\
 912 \\
 \underline{852} \\
 603 \\
 \underline{426} \\
 (177)
 \end{array}$$

$$\begin{array}{r}
 96)7400900(77092 \\
 \underline{672} \\
 680 \\
 \underline{672} \\
 890 \\
 \underline{864} \\
 260 \\
 \underline{192} \\
 (61)
 \end{array}$$

Here follow some other Sums, with their *Quotients* and *Remainders* only: their *Working* being purposely omitted; leaving that to the Learner, for a Trial of his Ingenuity.

As if you divide 796976499, by 49654, the *Quotient* will be 16050, and the *Remainder*, after the Work is ended, 29799.

Again, if you divide 5345678905, by 765432, the *Quotient* will be 6983, and the *Remainder* 667249.

Also, if you divide 45678901234, by 9876543, the *Quotient* will be 46249, and there will be a *Remainder* of 8775138.

And if you divide 123456789012, by 123456789, there will be for the *Quotient* 1000, and for the *Remainder* 12.

And that nothing may be wanting to a perfect Understanding of this *Rule*, I have subjoined the following *General Notes concerning Division*.

1st. So many Places as are in your *Divisor*, you point off so many in your *Dividend*, for your first *Dividual*, except the

the first Figure of the Divisor exceed the first of the Dividend, and then you move a Place farther towards the right Hand, and make your Point there; and then your Dividual mark'd out, hath a Figure more than your Divisor; and then you must take the first Figure of your Divisor out of the two first Figures of your Dividual.

2dly, You never Place a Cypher in the Quotient the first time you seek.

3dly, The Times that you take the Divisor out of the Dividual, never exceed 9.

4thly, The Dividual never exceeds the Divisor above one Figure.

5thly, You never bring down but one Figure or Cypher at a Time, out of the Dividend.

6thly, For every Figure or Cypher brought down from the Dividend, there must be one, or a Cypher placed in the Quotient also.

7thly, When you cannot take the Divisor out of the Dividual, you must put a Cypher in the Quotient, and take another Figure from the Dividend: And if, again you cannot take it, place another Cypher in the Quotient, and then seek again.

8thly, When at any time, after you have subtracted, there remains nothing, and yet there remains a Cypher, or Cyphers in the Dividend, it, or them must be put in the Quotient as Part of it, and the Work is done; and there will be no Remainder.

The short Italian Way of DIVISION.

There is another Way of *Division* shorter than the foregoing, because you omit setting down the several Products of your *Multiplication*, but multiply and subtract together; and is like the common *Scratch* or *Cancelling Way of Division*, only you are not at the Trouble of removing your Divisor every Time you seek, as in that Way you are.

Example

Let us divide the second *Example* in Page 100, by this (as it is called) short *Italian Way*; viz. Divide 16790 Days by 365. In order to the Work I set it down as before, thus:

$$\begin{array}{r}
 365 \overline{) 16790} \text{ (46} \\
 \underline{2190} \\
 \text{(0)}
 \end{array}$$

Here I seek (as before) how oft I can have 3 in 16 (my Point being under 9, for the Dividual) and I find I can have but 4 times; wherefore I put 4 in the Quotient, and multiply the Divisor (as before) saying 4 times 5 is 20, but I do not set down 0, and carry 2, as in the other Way; for the Product must not be set down, as was said before, but forthwith subtract, saying, 4 times 5 is 20, 20 from 9 I cannot, but 20 from 29, (borrowing two Tens) and there remains 9, which I set under the Line; then 4 times 6 is 24, and 2 that I borrowed 26, from 7 I cannot, but 26 from 27, and there remains 1, which I also set down; then 4 times 3 is 12, and 2 that I borrowed is 14 from 16 and there remains 2; which I place under the Line; then there is a Remainder of 219 to which I bring down the Cypher out of the Dividend, and then I have the last Dividual 2190 then I say the 3's in 21, 6 times, by which I multiply the Divisor, saying 6 times 5 is 30, from 0 I cannot, but 30 from 30 (borrowing 3 Tens) and there rests 0; then 6 times 6 is 36, and 3 that I borrowed is 39, from 9 I cannot, but 39 from 39 and there remains 0; then 6 times 3 is 18, and 3 that I borrowed is 21 from 21, and there remains 0; and so the Work is done.

Let

Let another *Example* be this : Divide 345678901 by 2345, which is the third *Example* in Page 101.

$$2345)345678901(1$$

$$\begin{array}{r} \cdot\cdot \\ 11117 \\ \hline \end{array}$$

Here I say, once 5 is 5, from 6, and there remains 1, &c. then I bring down the 7, and set 4 in the Quotient, and say 4 times 5 is 20, from 7 I cannot, but 20 from 27, and there remains 7. Then 4 times 4 is 16, and 2 that I borrowed is 18, from 1 I cannot, but 18 from 21, and there remains 3. Then 4 times 3 is 12, and 2 is 14, from 1 I cannot, but 14 from 21, and there remains 7. Then 4 times 2 is 8 and 2 is 10, from 11, and there remains 1; so that there remains 1737, to which I bring down the next Figure 8, for the Dividual, and the Work stands thus :

$$2345)345678901(14$$

$$\begin{array}{r} \cdot\cdot \\ 11117 \\ \hline \end{array}$$

$$17378$$

Again, I seek, and Put 7 in the Quotient, and say 7 times 5 is 35, from 8 I cannot, but 35 from 38, and there remains 3. Then 7 times 4 is 28. and 3 that I borrowed is 31, from 7 I cannot, but 31 from 37, and there remains 6. Then 7 times 3 is 21, and three that I borrowed is 24, from 3 I cannot, but 24 from 33, and there remains 9. Then 7 times 2 is 14, and 3 that I borrowed is 17, from 17 and there remains 0. Then I bring down the next Figure 9, and the Work appears thus :

$$F\ 6.$$

$$2345)$$

$$2345)345678901(147$$

$$11117$$

$$17378$$

$$9639$$

Then I bring down the rest of the Figures one after another, working as before, 'till the whole is finished in the following Manner.

$$2345)345678901(147411$$

$$.....$$

$$11117$$

$$17378$$

$$9639$$

$$2590$$

$$2451$$

Remainder (106)

Thus have I explained both the *Italian* Ways of Division leaving it to the Learner to use which he likes best. But my Method will be to pursue the first *Italian* Way thro' the remaining Part of this Book, it being very plain and easy to be understood.

There is a very short Way of Division (I think the shortest that can be) by Cancelling; and so I shall give one *Example* to shew its Brevity: My Design in this Book, being not only to shew the most intelligible, but the shortest Way of working in all the Rules.

Example

Example.

$$\begin{array}{r}
 11(1 \\
 472(4 \\
 142584(3 \\
 \text{Divide } 6945407 \text{ by } 276)694507(25164
 \end{array}$$

First I seek, and find I can take two times, and say, twice 6 is 12, from 4 I cannot, but 12 from 14 (the 2 being over the Point or Stop for the first Dividual) and there remains 2; then twice 7 is 14, and 1 is 15, from 19, 4; then twice 2 is 4, and 1 is 5, from 6, 1: And then there is 1425 for the new Dividual, &c. See the Work; the Quotient being 25164, and the Remainder 143.

VIII. When there is a Cypher, or Cyphers, in the Divisor, towards the right Hand, you may cut it, or them off, with a downright Stroke of the Pen, and also do the same with as many Figures, or Cyphers to the right of the Dividend; and then divide the remaining Figures of the Dividend, by the remaining Figures of the Divisor, as if there had been no Cyphers in the Divisor, or Dividend; and what you cut off from the Dividend, is the Remainder, or Part of it: for what remains after the Work is done, must be put to what you cut off from the Dividend, for the whole Remainder.

Examples.

By the short Italian Way.

$$\begin{array}{r}
 24|00)7694|06(320 \quad 345|000(8092320|000(23456 \\
 \quad 72 \quad \quad \quad 1192 \\
 \quad \hline \quad 49 \quad \quad \quad 1573 \\
 \quad 48 \quad \quad \quad \hline \\
 \quad \hline \quad 1932 \\
 \quad \hline \quad 2070 \\
 \quad \hline \text{Rem. (1406)} \quad \quad \text{Rem. (0)}
 \end{array}$$

For

For the first of these *Examples*, there are two Cyphers in the Divisor, wherefore I cut off two Places from the Dividend, and divide 7694 by 24, and there remains 14 at the last; to which I bring down the two Places cut off, *viz.* 06, and annex them to the 14, for the whole Remainder, *viz.* 1406, and the Quotient is 320.

In the second *Example* there are 3 Cyphers in the Divisor, which I cut off; and also as many in the Dividend; and divide by 345; and then the Work is done, and there remains nothing.

IX. Any Division Sum, when the Divisor is such a Number that any two Digits or Numbers in the Multiplication Table, being multiplied together, do make it, *viz.* the Divisor, then such Sum may be done at two Divisions, or by component Parts much sooner, and in fewer Figures than at one.

Examples.

Divide 16560 by 48.

At one Division

48)16560(345

...
144

216

192

240

240

(0)

At two Divisions, or component

6)16560 (Parts

8) 2760

345 Quotient,

Here

Here the two Numbers in the Table, multiplied together, that make the Divisor, are 6 and 8, for 6 times 8 is 48, the Divisor: Wherefore I divide the Dividend 16560 by 6, and the Quotient is 2760, which I divide by 8, the second Number, and the Quotient, by that, is the true Quotient sought, viz. 315, as in the common Way.

Bring 1212288 Ounces of *Raw Silk*, into Pounds of 24 Ounces.

At one Division.
24)1212288(50512

.....

120

122

120

28

24

48

48

(0)

At two Divisions, or component
12)1212288 (Parts

2) 101024

50512 *Quot. sought.*

Here are eleven Figures Difference between the one Way and the other.

More

*More Examples.**At one Division.*

$$72)488808(6789$$

...

$$\underline{432}$$

$$568$$

$$\underline{504}$$

$$640$$

$$\underline{576}$$

$$648$$

$$\underline{648}$$

$$(0)$$

By two Divisions, or Components.

$$8)488808 \quad (\text{Part}$$

$$\underline{9)61101}$$

$$\underline{6789} \text{ Quotient.}$$

Here if I had taken 6 and 12 for my Divisors, they would have produced the same Quotient, for 6 times 12 is 72, as well as 8 times 9.

(56 the Divisor

$$7)18648$$

$$\underline{8) 2664}$$

333 *Quotient sought**(99 the Divisor*

$$9)537768$$

$$\underline{11)59752}$$

$$\underline{5432}$$

If there happen to be any Remainder, either in the first or second Division, or in both, yet the Quotient will be the same. But when there are Remainders, the Way to find the true Remainder, as if you divided at once, is to multiply the first Divisor by the last Remainder, taking in the first Remainder, if any be.

95

Of M O N E Y.

X. Now I will shew how to divide Pounds, Shillings, and Pence, without reducing them any other-wise than in your Mind; and also how this Rule answers many Questions that seem to require a Recourse to the *Rule of Three* for their Solution.

Divide 12*l.* 10*s.* 6*d.* among 5 Persons.

Divisor 5)12 10 6 Dividend.

Each must have 2 10 1 $\frac{1}{5}$ Quotient or Answer.

Here I say the Fives in 12, twice, and there remains 2, which are two Pounds, (for the Remainder is always the same with your Dividend) or 40 Shillings, and 10*s.* in the Shillings Place, is 50*s.* the Fives in 50, ten times, which I put in its Place, *viz.* under the Place of Shillings. Then the Fives in 6, once, and there remains 1, which is one Fifth of a Penny. So each Man must have 2*l.* 10*s.* 1*d.* $\frac{1}{5}$ for his Share.

The common Way.

The foregoing Work is much sooner done, and looks a great deal handsomer than that in the Margin; for there you are obliged to reduce the 12*l.* 10*s.* 6*d.* into Pence, and then you divide by 5, and the Quotient gives the Pence each Person must have; and then those Pence are brought into Pounds, &c. The Sum above is proved by the brief Rules in the Multiplication of Money, sufficiently shewn in that Rule, in the following Manner.

<i>l.</i>	<i>s.</i>	<i>d.</i>
12	10	6
20		
—		
250		
12		
—		
5)3006($\frac{3}{5}$		
—		
12)601(1		
—		
2,0)50(1		
—		
1. 2	10	1 $\frac{1}{5}$
—		
	1. 2.	&c.

$$\begin{array}{r} \text{£. } 2 \quad 10 \quad 1 \frac{1}{5} \text{ Each.} \\ \hline \quad \quad \quad 5 \text{ Persons.} \end{array}$$

$$\begin{array}{r} \text{£. } 12 \quad 10 \quad 6 \text{ Proof.} \\ \hline \end{array}$$

In the excellent Method of *Division* of several Denominations (for *Weight* or *Measure* may be so divided as well as *Money*) whatever remains you always bring it (in your Mind only) into the Quality of the next Denomination towards the right Hand; and if there be any thing there, you take it in, and then seek, &c. as in the foregoing Sum, where I said, the Fives in 12, twice, and there remained 2, which I turned into Shillings, (the Name of the next Denomination) which, with the 10 Shillings in the Place of Shillings, make 50; then I say the Fives in Fifty, &c.

8)

Again, Divide $\text{£. } 67 \quad 09 \quad 4$ among 8 Persons.

Quotient $\text{£. } 08 \quad 08 \quad 8$ Answer.

Here I say the Eights in 67, 8 times, and there remains 3 £. or 60 Shillings, and 9 Shillings in the Place of Shillings, is 69, the Eights in 69, 8 times, and there remains 5 Shillings, or 60 Pence, and the 4 £. in the Place of Pence, make 64; the Eights in 64, 8 times, and nothing remaining. So each must have $\text{£. } 8 \quad 08 \quad 8$. as by the Work above.

If 5 Gallons of Brandy cost $\text{£. } 1\text{l. } 16\text{s. } 8\text{d.}$ what is that the Gallon?

A General Rule.

Divide the Money by the Quantity: And here I say the Fives in 36, &c.

$$\begin{array}{r} \text{l.} \quad \text{s.} \quad \text{d.} \\ 5 \overline{) 1 \quad 16 \quad 8} \end{array}$$

$$\text{Answer } 0 \quad 07 \quad 4$$

$$\text{Proof } 1 \quad 16 \quad 8$$

If 9 Stone of Beef cost
what is that a Stone?

$$\begin{array}{r} 9 \overline{) \text{s.} \quad \text{d.}} \\ 16 \quad 6 \\ \hline 1 \quad 10 \end{array}$$

If 9 Gallons of Arrack cost
what is that a Gallon?

$$\begin{array}{r} 9 \overline{) \text{l.} \quad 4 \quad 08 \quad 1 \frac{1}{2}} \\ \hline \text{Answer } 0 \quad 09 \quad 09 \frac{1}{2} \end{array}$$

If 11 C. of Hops cost
what is that per C?

$$\begin{array}{r} 11 \overline{) \text{l.} \quad 53 \quad 01 \quad 06} \\ \hline \text{Answer } 4 \quad 16 \quad 06 \end{array}$$

If the Charge of a Country Feast amounts to 314*l.*
16*s.* 8*d.* and it is to be paid by 12 Stewards, what
must each Steward pay?

$$\begin{array}{r} 12 \overline{) \text{l.} \quad 314 \quad 16 \quad 8} \\ \hline \text{Each must pay } \text{l.} \quad 26 \quad 04 \quad 8 \frac{1}{2} \frac{8}{12} \\ \hline 314 \quad 16 \quad 8 \text{ Proof.} \end{array}$$

XI. As in Division of one Denomination, according to the 9th. Rule of this Chapter, where two Numbers in the *Multiplication-Table* make the Divisor, being multiplied together, the Work might be performed at two Divisions; so in *Division* of several Denominations, the Work may be done after the same Method, following the Directions given in the said 9th Rule.

Example.

A Reckoning of *l.* 6 00 00 among 32 Men, what must each Man pay?

$$\begin{array}{r}
 4) \text{ l. } 6 \quad 00 \quad 0 \\
 \hline
 8) \text{ l. } 1 \quad 10 \quad 0 \\
 \hline
 \text{Each pays } 0 \quad 3 \quad 9
 \end{array}$$

Here the two Numbers are 4 and 8, therefore I first divide by 4, and then that Quotient by 8; or first by 8, and then by 4, it will be all one.

If 56lb. of Coffee cost
what is that a Pound?

$$\begin{array}{r}
 7) \\
 \text{ l. } 21 \quad 11 \quad 8 \\
 \hline
 8) 3 \quad 01 \quad 8 \\
 \hline
 \text{Anfw. } 00 \quad 07 \quad 8\frac{1}{2}
 \end{array}$$

Divide $\overset{10}{\text{ l. } 32 \quad 12 \quad 6}$ between 100 Persons.

$$\begin{array}{r}
 10) 3 \quad 05 \quad 3 \\
 \hline
 0 \quad 06 \quad 6\frac{3}{10} \text{ each.}
 \end{array}$$

If 72 Gallons of Wine cost
what a Gallon?

$$\begin{array}{r}
 8 \\
 \text{£ } 19 \ 4 \ 0 \\
 \hline
 9 \overline{) 208 \ 0} \\
 \hline
 \text{Answ. } 0 \ 05 \ 4
 \end{array}$$

If 8 lb. of Nutmegs cost
what a Pound?

$$\begin{array}{r}
 \text{£ } 9 \overline{) 49 \ 17 \ 3 \frac{1}{4}} \\
 \hline
 9 \overline{) 5 \ 10 \ 9 \frac{1}{4}} \\
 \hline
 \text{Answ. } 0 \ 12 \ 3 \frac{1}{4}
 \end{array}$$

If 45 C. of Hops cost
what 1 C. Weight?

$$\begin{array}{r}
 \text{£ } 5 \overline{) 120 \ 07 \ 6} \\
 \hline
 9 \overline{) 24 \ 01 \ 6} \\
 \hline
 \text{Answ. } \text{£ } 2 \ 13 \ 6
 \end{array}$$

A General RULE for WEIGHT.

Having the price of a C. Weight, to know the Price of a Pound. Divide by 7 and 8, (7 times 8 being 56, the Half Hundred Weight) and take the Half of the last Quotient, which Half will be the Answer.

Examples.

If 112 lb. of Cast-Iron cost
what a Pound?

$$\begin{array}{r}
 \text{s. } d. \\
 7 \overline{) 2 \ 4} \\
 \hline
 8 \overline{) 4} \\
 \hline
 2
 \end{array}$$

The Half of a Half-penny is

$\frac{1}{2}$ Price of a lb

If

If 112*lb*. of Lead cost
what a Pound?

$$\begin{array}{r} 7) \\ 7s \\ \hline 8) \quad 1 \\ \hline \quad 1 \frac{1}{2} \\ \hline \end{array}$$

The Half is $\frac{3}{4}$

If 112*lb*. of Sugar cost
what a Pound?

$$\begin{array}{r} 7) \\ l. \quad 1 \quad 17 \quad 4 \\ \hline 8) \quad 05 \quad 4 \\ \hline \quad \quad 8 \\ \hline \end{array}$$

The Half of 8 is $4d.$ Answ.

If 112*lb*. of Currants cost
what a Pound?

$$\begin{array}{r} 7) \\ l. \quad 3 \quad 10 \\ \hline 8) \quad 10 \\ \hline \quad 1 \quad 3 \\ \hline \end{array}$$

The Half of 15*d.* is $7\frac{1}{2}$

So at any time, in any Division Sum, if the Divi-
for be 112, the Quotient is soon found by this Way
of *Division* by Parts.

I will give one *Example* also by the common Way,
to shew the Tediousness of the one, and the Expedi-
tion of the other.

The

and
the

The common Way.

Divide *l.* 1476 19 8 $\frac{1}{4}$ between 27 Persons.

$$\begin{array}{r} 20 \\ \hline 29539 \\ 12 \\ \hline 354476 \\ 4 \\ \hline \end{array}$$

27)1417907 *Farth.*

4)52515 *Farthings each.*

....

$$\begin{array}{r} 135 \\ \hline \end{array}$$

$$\begin{array}{r} 12)13128 \frac{3}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 67 \\ \hline \end{array}$$

$$\begin{array}{r} 2|0(109|4 \\ \hline \end{array}$$

$$\begin{array}{r} 54 \\ \hline \end{array}$$

Answer. l. 54 14 0 $\frac{3}{4}$

$$\begin{array}{r} 139 \\ \hline \end{array}$$

$$\begin{array}{r} 135 \\ \hline \end{array}$$

$$\begin{array}{r} 40 \\ \hline \end{array}$$

$$\begin{array}{r} 27 \\ \hline \end{array}$$

$$\begin{array}{r} 137 \\ \hline \end{array}$$

$$\begin{array}{r} 135 \\ \hline \end{array}$$

(2)

The other Way.

$$\begin{array}{r} 3)1476 \quad 19 \quad 8 \frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 9)492 \quad 06 \quad 6 \frac{1}{4} \frac{1}{2} \\ \hline \end{array}$$

Answer. l. 54 14 0 $\frac{3}{4}$

Here is a prodigious Difference between one Way and the other, one having almost 60 Figures more in the Work than the other.

Note,

Anfw

e Divi-
s Way

Way,
Expedi-

The

Note, That Weight and Measure may be divided by Parts, as Money.

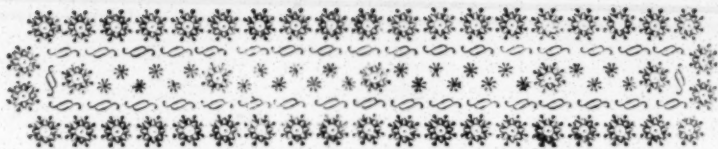
Example.

If 42 Bags of *Spanish Wool* weigh 110 1 00
what 1 Bag?

$$\begin{array}{r}
 6) \text{C qrs lb.} \\
 110 \quad 1 \quad 00 \\
 \hline
 7) \quad 18 \quad 1 \quad 14 \\
 \text{Answ. } 2 \quad 2 \quad 14
 \end{array}$$

If 45 Pieces of Linnen contain
what one Piece?

$$\begin{array}{r}
 9) \text{Yds. qrs. Nls.} \\
 2157 \quad 0 \quad 3 \\
 \hline
 5) 239 \quad 2 \quad 3 \\
 \hline
 \text{Answ. } 47 \quad 3 \quad 3
 \end{array}$$



CHAP. VI.

REDUCTION.

I. **I**S wholly performed by *Multiplication* and *Division*; and teaches to bring or change Numbers of one Denomination into Numbers of another, without the least Alteration of Value, tho' in different Terms. For Instance,

Suppose I am to bring 20/. into Farthings, which when I have done, the Work will produce 19200 Farthings which

which are equal in Value to £. 20 : For when they are reduced rightly back again, the last Quotient will percifely produce £. 20. neither more nor lefs.

II. All great Names are brought into smaller of equal Value, by *Multiplication*; that is, by multiplying the given Number by as many of the next leffer Name, as makes one of that greater; as *Pounds* into *Shillings*, *Pence*, or *Farthings*. Or *Tuns Weight* into *Pounds Weight*, &c.

III. All small Names are brought into greater, of equal Value, by *Division*; that is by dividing the given Number by as many of the leffer, as makes one of the next greater Name; as *Farthings* into *Pence*, *Shillings*. or *Pounds*: or *Pounds Weight* into *Quarters*, *Hundreds*, or *Tuns Weight*.

Example 1.

In 20 <i>l.</i> how many Farthings?	20 <i>s</i>
20 Shillings makes a Pound.	12
400 Shillings in 20 <i>l.</i>	Pence, 240 in a Pound.
12 Pence makes 1 <i>s</i>	4
4800 Pence in 20 <i>l.</i>	Farth. 960 in a Pound.
4 Farthings, one Penny	—
Or thus:	
19200 Farthings in 20 <i>l.</i>	20 <i>l.</i>
	960 Farthings
	— in a Pound.
	Farthings. 19200 Answer.

In the Question above, it is required to bring *Pounds* into *Farthings*, which is a great Name to be brought into a smaller; which, according to the II^d Rule of this Chapter, is to be done by *Multiplication*. Wherefore, as is there directed, I multiply the given Number, 20*l.* by 20, the

the Shillings in a Pound, and the Product is the Shillings in 20/. Then those Shillings by 12, the Pence in a Shilling, and the Product is the Pence in 20/. and those Pence by 4, the Farthing in a Penny, and that Product is the Farthings in 20/. and the Answer to the Question, as may be seen by the preceding Work.

Or, as before, I multiply the 20/. by 960, the Farthings in a Pound, but I multiply 960 by 20, tho' the 20 be uppermost, to save Room; for, at any time the *Multiplier* may be multiplied by the *Multiplicand*, the Product being the same either Way.

By the foregoing Method are all *Reductions* descending, (that is, from great Denominations to lesser) work'd, whether they be *Money*, *Weight* or *Measure*, that is, by considering how many of the next lesser make a Unit, or one of the foregoing greater Denominations, as before directed; and then multiply accordingly, descending from one denomination to the next, till the Work is finished. And for further Assistance, respect must be had to the several Tables of Quantity in *Money*, *Weight* and *Measure*, in the II^d Chapter of this Book.

Pounds multiplied by 20 produce Shillings; Shillings multiplied by 12 give Pence; Pence multiplied by 4 produce Farthings.

Farthing divided by 4 are Pence; Pence divided by 12 quote Shillings; Shillings divided by 20 are Pounds.

Example 2.

In 19200 Farthings, how many Pounds?

$$\begin{array}{r} 4 \overline{) 19200} \\ \hline \end{array}$$

$$\begin{array}{r} 12 \overline{) 4800} \\ \hline \end{array}$$

$$\begin{array}{r} 12 \overline{) 400} \\ \hline \end{array}$$

l. 20 Answer.

Or thus :

l.

$$\begin{array}{r} 96 \overline{) 19200} (20 \\ 192 \\ \hline \end{array}$$

(0)

Here

Here it is required to bring Farthings into Pounds: which is a small Name into a greater; and therefore, according to the III^d Rule of this Chapter, it is done by Division: Wherefore I divide the given Number, 19200 by 4, the Farthings in a Penny, and the Quotient is Pence; and those Pence I divide by 12, the Pence in a Shilling, and the Quotient is Shillings; and those Shillings I divide by 20, the Shillings in a Pound, and the Quotient is Pounds; to wit, 20^l, and is a sure Proof of the foregoing *Example*.

Or I divide the 19200 Farthings by 960, the Farthings in a Pound, and the Quotient is the same, *viz.* 20^l.

Example 3.

In 576^l. how many Shillings, Pence, and Farthings?

By 20

11520 Shillings.

By 12

1382040 Pence

By 4

552960 Farthings.

(This is a great Name to be brought into a smaller, and therefore I multiply.)

Example 4.

In 552960 Farthings, how many Pence, Shillings and Pounds

Divide by { 4)552960
 12)138240
 20)552960

l. 576 Answer and Proof.

This is the Reverse of the 3d *Example*, and a small Name to be brought into a great; and therefore I divide, and find *l.* 576 the Answer and Proof to the said *Example*; for *Reduction* ascending, proves *Reduction* descending; and the contrary.

Note, When you are to bring Shillings into Pounds (let the Number be what it will,) cut off the last Figure or Cypher towards the right Hand, and halve the other towards the left (which is dividing by 20, but shorter) and that Half shall be Pounds; and the Figure cut off is Shillings: And if any thing remain after the halving of the last Figure which is never more than one, it must be joined to the Figure, or Cypher cut off, as in the 4th Example foregoing and in the following, viz.

Bring 423|7 Shillings into Pounds.

l. 211-17

Here the $\frac{1}{2}$ of 4 is 2, the $\frac{1}{2}$ of 2 is 1, and the $\frac{1}{2}$ of 3 is 1, and there remains 1, which is 1 Ten, which must be put to the 7 cut off, and it makes 17s. So the whole is *l.* 211-17 as above. By the same Method may *Tuns* be reduced into *Hundreds Weights*.

A General RULE.

When you have Poundsto be Reduced into Farthings, multiply by 20, by 12 and by 4; or by 960, the Farthings in a pound.

When you have Farthings to be reduced into Pounds, divide by 4, by 12, and by 20, or by 960.

If Pounds are to be brought into Pence, multiply by 240, the Pence in a Pound: If the contrary, divide by 240.

Example

Example 5.

Reduce 476*l*. into Pence.

Or thus:

According to the 8th Rule of Chap. 4.

	240	
	19040	Here I multiply by 476 12, and by 2, twice 12 12 being 24; and for the Cypher I add it at the last.
	952	
Pence	114240	5712
		2

114240

Reduce 114240 Pence into Pounds, by dividing by 240.

240)114240(476 Answer,

Or thus:

96

12)114240

182

2) 952

168

Answ. *l.* 476

144

144

(0)

Here, in the second Way after I have cut off a Place from the Dividend, for the Divisor's Cypher, I divide by 12, and by 2, which multiplied together make 24, and for the Cypher to make it 140, there's a Place cut off from the Dividend; so that I divide only by 12, and by 2, according to the IXth Rule of the foregoing Chapter. See the Work above.

By the second Way there are many Figures, and much Trouble saved; as may be seen by comparing one Way with the other.

Example 6.

Bring 476 Pounds into Farthings, by multiplying
by

$$\begin{array}{r} 960 \\ 476 \\ \hline \end{array}$$

Or thus:

$$\begin{array}{r} l. 476 \\ 8 \\ \hline \end{array}$$

$$\begin{array}{r} 5760 \\ 6720 \\ 3840 \\ \hline \end{array}$$

$$\begin{array}{r} 3808 \\ 12 \\ \hline \end{array}$$

Farthings 456960

Farthings 456960

In the second Way I multiply by 8, and by 12, according to the VIIIth Rule of the IVth Chapter, 8 times 12 making 96, and I add the Cypher at last.

Example 7.

Bring 456960 Farthings into Pounds, by dividing
by

$$\begin{array}{r} 384 \\ \hline \end{array}$$

Or thus:

$$\begin{array}{r} 8)456960 \\ \hline \end{array}$$

$$\begin{array}{r} 729 \\ \hline \end{array}$$

$$\begin{array}{r} 672 \\ \hline \end{array}$$

$$\begin{array}{r} 12) 5712 \\ \hline \end{array}$$

$$\begin{array}{r} 576 \\ \hline \end{array}$$

$$\begin{array}{r} 576 \\ \hline \end{array}$$

l. 476 Answ.

(0)

IV. When the Sum to be reduced consists of several Denominations; as Pounds, Shillings, and Pence; or Tuns, Hundreds, Quarters, and Pounds, then you must multiply as before: but you must take in the Shillings, Pence, or Farthings, that stand in each Denomination, as you reduce the higher Name to the next inferior.

Example

Example 8.

In £. 426 19 8½, how many Farthings?

$$\begin{array}{r}
 20 \\
 \hline
 8539 \text{ Shillings.} \\
 12 \\
 \hline
 102476 \text{ Pence.} \\
 4 \\
 \hline
 409906 \text{ Farthings. Answer.} \\
 \hline
 \end{array}$$

Here I first multiply by 20, saying, 0 is nothing, but 9 that stands in the Units place of Shillings, is 9; then twice 6 is 12, and 1 that stands in the Tens Place of Shillings is 13, 3 and carry 1, &c. Then, when I come to reduce the Shillings into Pence, I say 12 times 9 is 108, and 8 that stands in the Place of Pence is 116, 6, and carry 11, &c. Then, when I reduce the Pence into Farthings, I say, 4 times 6 is 24, and 2 that stands in the Place of Farthings is 26, 6 and carry 2, &c. See the Work,

Example 9.

In 4) 409906 Farthings, how many Pence, Shillings,
(and Pounds?)

$$\begin{array}{r}
 d. \\
 12)102476\frac{1}{2} \\
 \hline
 s. \\
 2|0)853|9\cdot8d. \\
 \hline
 \end{array}$$

£. 426.19.8d.½ Answer and Proof.

I first divide by 4, and there remains $\frac{1}{2}$ that was taken in; and then by 12, and there remains the 8d taken in; and then by 20 (or cut off the last Figure, and halve the other, as before directed, to bring Shillings into Pounds) and there remains the 19 Shillings taken in.

Example 10.

4)
In 2403590 Farthings, how many Pounds, &c.

12)600897 $\frac{1}{2}$ Here I divide by 4, by 12, and by

20)500714-9d. 20, according to the foregoing

general Rule.

l. 2503-14 9 $\frac{1}{2}$

Example 11.

In l. 2503-14-9 $\frac{1}{2}$, how many Farthings?

20

50074 Here I multiply by 20, by 12, and by
12 4, according to the before-mentioned

general Rule.
600897
4

2403590 Farthings.

These two Sums are a Proof to each other.

*In 30 Merks, and 40 Groats, and 50 English Crowns,
How much in Value is their Worth, intrinsically in Pounds,*

Ans. 33 3 4

Example

*Example 12.*In *l.* 742-14-6, how many Pence?

$$\begin{array}{r}
 20 \\
 \hline
 14854 \\
 12 \\
 \hline
 178254 \text{ Ans.} \\
 \hline
 \hline
 \end{array}$$

Here I multiply by 20, and take in the 14s. and then by 12. and take in the 6, according to the IVth Rule of this Chapter.

Examples 13.

12)
In 178254 Pence, how many Pounds, &c.

$$\begin{array}{r}
 20)1485/4-6 \\
 \hline
 \hline
 l. 742-14-6 \text{ Answer.} \\
 \hline
 \hline
 \end{array}$$

In *l.* 759 17 8 $\frac{1}{2}$, how many Halfpence?*Answer* 364745.

Multiply by 20, 12, and 2.

Bring 364745 Halfpence into Pounds, &c.

Divide by 2, 12, and 20.

Or Halfpence may be brought into Pounds by dividing componently, by 480, and Pounds into Halfpence by multiplying by 480.

In *l.* 529 12 6 $\frac{5}{8}$, how many Eights of a Penny?*Answer* 1016885.

Multiply by 20, 12, and 8, taking in, &c.

G 5

Bring

Bring 1016885 Eights of a Penny into Pounds, &c.

Divide by 8, 12, and 20.

Any Number of Pence may be brought into Pounds, Shillings, and Pence at one Working, thus: Add a Cypher to the given Number and divide them by 240, as usual, doubling the last Figure of the Quotient for Shillings and the Remainder is Pence; as for *Example*: Bring the foregoing 13th *Example*, viz. 178254 Pence, into Pounds, Shillings, and Pence, at one Work.

2. [0]178254|0(74217

... 2

168

— fac. 742-14-6

102

96

65

48

174

168

Rem. (6d.)

Or thus:

2)178254

12)89127-6

742 7

2

l. 742-14-6

Here the last Figure, 7, doubled is 14, and the 6 remains.

Or thus:

12)178254

2)1485|4 6

l. 742-14-6

Here I omit the Cypher, because I neglect it in the Divisor.

So likewise may Farthings be brought into Pounds Shillings, Pence or Farthings, at one Work, by adding a Cypher, and dividing by 960, doubling the last Figure of the Quotient for Shillings, as above.

Example

In 39291 Farthings, how many *l. s. d.* and *qrs*?

Answer $\angle 40^\circ 18' 6''$

96|0)392910(40—09
 .. 2
 384 ———
 ——— 1.40 18 6 $\frac{3}{4}$ Answer.
 891 ———
 864 ———
 (27) *grs.* is 6d. $\frac{3}{4}$

Or you may omit adding the Cypher to the given Number, since you cut off the Cypher from your Divisor; but you must not forget to double the last Figure. Or it may be done at two Divisions, thus:

$$\begin{array}{r} 8 \overline{) 59291} \\ \underline{12} 4911 \frac{3}{8} \\ 409 \frac{3}{4} \\ 2 \\ \hline \text{Facit. l. } 40 \quad 18 \quad 6 \frac{3}{4} \end{array}$$

The first Remainder is $\frac{3}{2}$, and the last three Twopences.

Or by multiplying the first Divisor 8, by the last Remainder 3 taking in the first Remainder 3, (as the Rule in *Division* by component Parts directs) makes 27 Farthings, equal to $6d. 3$.

of COINS.

Here the several Species of *Coin* must be reduced into one Name whether Shillings, Pence, or Farthings ; and then divide the greater Number by the lesser, and the Quotient will be the Answer.

Example 1.

In £. 262 04-6 Sterling, how many Dollars, at
20 4s. 3d. Sterling?

5244
12

12

Divisor 51 Pence.

Doll.

51)62934 Pence. (1234 Answer.

As above directed, I reduce the Dollar into Pence, and it makes 51; and then also the £. 262-04-6 into the same Name, *viz.* Pence, and they are 62934, which I divide by 51, the Pence in a Dollar; and the Quotient is the Answer, *viz.* 1234 Dollars.

Example 2.

In 1234 Dollars, at 4s. 3d. how many *l. Sterl.*

51

12

1234 Multiply 51 Pence.

6170

12)62934 Pence.

2/0)524\4-6

Anfw. 1.262 04 6

Here I multiply the Number of Dollars by the Pence in one; and the Product is the Pence that are in them all; which I divide by 12, and by 20, which bring those Pence into Pounds.

Example

Example 3.

In £. 562-18, how many *French Crowns* at

(54d. $\frac{1}{8}$ per Crown.
8

20

11258

12

433

135096

8

_____ Crowns.

433)1080768(2496 Answer.

866...

2147

1732

4156

3897

2598

2598

(0)

Here I first bring the Crowns into Eights, by multiplying by 8, and taking in the 1 over the 8; and then I do the same, by £. 562-18, that the Dividend and Divisor may be of the like Name; and then I divide the one by the other, and the Quotient gives the Answer, viz. 2496 Crowns:

Example

Examples. 4.

In 2496 French Crowns, at 54d. $\frac{1}{8}$ per Crown, how
433 8 [many l. Sterl.

$$\begin{array}{r} 7488 \\ 7488 \\ \hline 9984 \end{array}$$

8)1080768 Eights.

$$\begin{array}{r} 12)135096 \\ 210)112513 \end{array}$$

l. 562 18 Anf. and Proof to the above Question.

Example 5.

In 426 Pistoles, at 17s. each, how many Guineas, at

$$\begin{array}{r} 204 \quad 12 \quad 21s. 6d. \\ \hline 1704 \text{ Pence} \quad 204 \text{ Multiplier.} \quad 12 \\ 8520 \quad \text{Divisor } 258 \end{array}$$

258)86904(336 $\frac{216}{258}$ Guineas Answer.

$$\begin{array}{r} 774 \dots \\ \hline \end{array}$$

$$950$$

$$774$$

$$1764$$

$$1548$$

$$(216)$$

Here the Pence in 426 Pistoles, are divided by the Pence in a Guinea, and the Quotient is the Answer, viz. 336 Guineas, and 216 Pence over, which is 18 Shillings.

Example

Example 6.

In 336 Guineas, and 216 Pence, how
Pence in a Guinea. 258 (many Pistoles at 17*s.* each?

$$\begin{array}{r}
 \text{-----} \quad \quad \quad \text{12} \\
 2688 \\
 1680 \quad \quad \text{Divisor } 204 \\
 672 \\
 \text{-----} \quad \text{216 Pence that remained.} \\
 \text{----- Pistoles.} \\
 204)86904(426 \text{ Answer and Proof to the} \\
 \quad 816.. \quad \quad \text{(foregoing Question.} \\
 \text{-----} \\
 \quad 530 \\
 \quad 408 \\
 \text{-----} \\
 \quad 1224 \\
 \quad 1224 \\
 \text{-----} \\
 \quad (0)
 \end{array}$$

Pistoles of 17*s.* are brought into Guineas of 21*s.* by multiplying by 17, and dividing by 21.

Example 7.

In 436 Pistoles, how many Guineas?

Answer $352\frac{2}{3}$ That is, 353 Guineas, wanting 1*s.*

Guineas into Pistoles by the contrary Practice.

Broad-pieces at 23*s.* are brought into ditto at 25*s.* by taking $\frac{1}{4}$ Part, viz. Pieces 246 at 23*s.* amounts to 282*l.* 18*s.* the $\frac{1}{4}$ of which gives 61*l.* 10*s.* that is of 246, which put to 246 Pieces, makes 307*l.* 10*s.* the Value of 246 Broad-pieces at 25*s.*

Example

Example 8.

In 1546 Pieces of Eight, at 4s. 6d. how many l. Sterl.

54 Pence in one	12
—— Pieces of Eight. —	
6184	54
7730	

12)83484 Pence in them all.

2'0)6957

l. 347-17 Answer,

Or this Question may be done by *Multiplication of Money*, according to the Method taught in that Rule, thus :

1546 Pieces of Eight, at	s. d.
	4 6
	10
l. 02 05 0	The Value of 10
	10
22 10 00 of 100.	
	10
1000—225 00 00	
500—112 10 00	
40— 9 00 00	
6— 1 07 00	
Answ. 1546 l. 347 17 00	

Example

Again, Marks are brought into Pounds by deducting $\frac{1}{4}$
Example the 9th.

In 746 Marks, how many Pounds ?

248 13 4 The $\frac{1}{4}$ to be deducted.

l. 497 04 8 Anf. and Proof to the Example above.

*In 40 Marks, and 90 Groats and Pounds in Number ten,
 The Pence and Farthings there contain'd, I ask it from
 your Pen.*

Answer. { 9160 Pence. }
 { 36640 Farthings. }

The 10th Example foregoing may be done by *Multi-
 plication*, thus:

746 Marks at 13 4
 10

Or thus:

746	l. 6	13	4	{ Value of
4			10	{ 10 Marks.
2984	66	13	4	{ Ditto 100
4			7	{ Marks.
12)119360	466	13	4	{ Ditto 700
	26	13	4	{ Ditto 40
2,0)994 6-8	4	00	0	{ Ditto 6
<u>l. 497 06 8</u>	<u>Anfw. l. 497</u>	<u>06</u>	<u>8</u>	<u>746</u>

In the Example on the left Hand, after I have multi-
 plied by 4 and by 4, I annex a Cypher, to make the last
 Product Pence ; in regard that there's a 0 in 160, the
 Pence in a Mark,

Example

Example 11.

In £. 389 10, how many Florins, at 3s. 2d.

$\begin{array}{r} 20 \\ \hline 7790 \\ 12 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ \hline 38d. \\ \hline \end{array}$
Florins.	
38)93480(2460 Answer.	
76...	
174	
152	
228	
228	
(0)	

Example 12.

In 2460 Florins, at 3s. 2d. how many £. Sterling?

$\begin{array}{r} 38 \\ \hline 19680 \\ 7380 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ \hline 38 \text{ Pence.} \\ \hline \end{array}$
---	---

12)93480 Pence.

2.0)779|0

£. 389 10 Answer and Proof.

* * At any Time when you can discover how many of one Sort of Pieces or Coin, are equal to any Number of the other, the Example is speedily done, by multiplying by the Lesser, and dividing by the greater Number. Example. In 542 4d. $\frac{1}{2}$, how many 13d. $\frac{1}{2}$? Multiply by 3, and divide by 9. Answ. $180\frac{2}{3}$ Pieces 13d. $\frac{1}{2}$, there bring 3 4d. $\frac{1}{2}$, and 9 Halfpence in 4d. $\frac{1}{2}$.

Example

Example 13.

In 2712 Guilders, at 2s. each, how many Rix-Dollars,
96 (at 4s. 5d. 1/2)

16272	Halfpence 48 in 2s.	12
24408	2	53
	—	4
214)260352(1216 Rix-dol.]	96 in a Gil.	—
214...	—	214 grs. in a
		— (Dollar)

463

428

355

214

1412

1284

(128)

Here the Answer is, 1216 Rix-Dollars, and 128 Farthings, Remainder, or 2s. 8d.

Pounds are brought into Guineas by multiplying by 20, and dividing by 21; thus:

In 730l. how many Guineas?

20

7)14600

s.

3)2085-5

Answer 695 Guineas, and 5s. over.

If I had Nobles Eighty Score, and Marks just Fifty two,
In Part of 1400l. what Money rests still due?

Answer 832 l.

In

In 695 Guineas, and 5s. how many Pounds?

Guin. s.

695 5

7 and 3 multiply by.

$$\begin{array}{r}
 4865 \\
 \underline{3} \\
 2,01460.0 \\
 \underline{\quad} \\
 1.730 \text{ Proof.}
 \end{array}
 \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \begin{array}{l} \\ \text{The 5 Shillings taken in.} \\ \end{array}$$

Example 14.

In 798 l. how many Nobles, Marks,
Nobles in 20s. 3 Crowns, Shillings Pence,
and Farthings?

Nobles 2)2394

Marks 1197

Crowns in a Pound 4

Crowns 3192

Shillings in a Crown 5

Shillings 15960

Pence in a Shilling 12

Pence 191520

Farthings in a Penny 4

Farthings 766080

I bring the Nobles into
Marks, by dividing them
by 2, because 2 Nobles
make a Mark.

Examples

Examples for Practice

In *l.* 74622 17 6, how many Half-Crowns?

Multiply by 8, and take in 7.

Answ. 596983

In *l.* 22740 13 4, how many Nobles?

Multiply by 3, and take in 2.

Answ. 68222

In 76543 *Bitts* of *Jamacia*, each $7d. \frac{1}{2}$ *Sterling*, how many Pounds *Sterling*?

Answ. *l.* 2391 194 $\frac{1}{2}$

In *l.* 1725 19 4 *Sterling*, how many *Spanish* Dollars, at 4*s.* 4*d.*

Answ. 7966

In 279623 Millreas of *Portugal*, at 5*s.* 3*d.* $\frac{1}{4}$, how many Pounds *Sterling*?

Answ. *l.* 73692 06 2 $\frac{1}{2}$

In 1276 Moidores, at 26*s.* 6*d.* how many Guineas, at 21*s.*

Answ. 1610 $\frac{49}{252}$

In 150000 *Crufadoes*, each 400 Reis, 1000 Reis to a Millrea, at 5*s.* 6*d.* *Sterling*, how many Pounds *Sterling*?

Answ. 16500

In *l.* 3400 how many Crowns, Half-Crowns, Shillings, Groats, and Three-Pences, and of each the same Number?

Anf. 7486 Pieces of each Sort, and 18*d.* over.

AVOIR.

AVOIRDUPOIS-WEIGHT.

In reducing this Weight, *Troy-Weight*, or of *Measure*, *Time*, &c. you must be acquainted with the *Tables of Quantity*, in the 2d Chapter of this Book.

Example 1.

Tuns. C. qrs. lb.
In 24 14 3 15 how many Pounds Weight?
20 C. 1 Tun.

494 Hundreds Weight.
4 Qrs. 1 C.

1979 Quarters.
28 lb. 1 qr.

15837
3959

A. 55427 Pounds.

Here are great Names to be brought in smaller, and therefore to be done by *Multiplication*; wherefore I multiply, according to the Table in the a^ore-mentioned Chapter, *viz.* by 20, by 4, and by 28; taking in the odd Weight in each Denomination, as in *Reduction of Money*; and the last Product is the Answ. *viz.* 55427.

Example

Example 2.

In $\overset{28)}{55427}$ Pounds, how many Tuns &c.

$\overset{\dots}{28}$

274

252

 222

196

 267

252

 (15)

 $4)1979$

 $2|0)49|4-3$

 Tuns 24 1 $\frac{1}{4}$ 3 15 Anst.

Here I proceed reversely, dividing by 28, by 4 and by 20. Or this *Division* Sum may be done by 4 and 7, the component Parts of 28.

In 5036 Pounds Weight of Cotton, how many Hundreds Weight?

C. qrs. lb.

Answer. 44 3 24

Example

Example 3.

C. qrs. lb. oz. dr.

In 24 3 24 12 14 how many Drams ?

4 Qrs. 1 C.

99 Quarters.

28 lb. 1 Quarter.

796

200

2796 Pounds.

16 Oz. 1 lb.

16778

2797

44748 Ounces.

16 Drams 1 Oz.

268492

44749

In 16)715982 Drams, how many Hundreds, &c. 4)

64....

16)44748

28)2796(99

32...

252 243.

75

127

276

64

112

252

119

154

(24)

112

144

78

108

64

96

142

(12)

128

(14) C. 24 3 24 12 14 Answ. and Proof.

H

Example

Example 4.

In C. 24 3 26 how many Pounds ?

$$\begin{array}{r}
 4 \\
 \hline
 99 \\
 28 \\
 \hline
 798 \\
 200 \\
 \hline
 \end{array}$$

Anfw. 2798 Pounds.

Or thus:

$$\begin{array}{r}
 112 \text{ lb. a C. Weight.} \\
 24 \text{ The Number of C.} \\
 \hline
 448 \\
 224 \\
 \hline
 110 \text{ The odd Weight.} \\
 \hline
 \end{array}$$

lb. 2798 Anfw.

Example 5.

C. qrs. lb.

In 425 3 22 how many Pounds ?

Mult. by 112

$$\begin{array}{r}
 5100 \\
 425 \\
 \hline
 106 \text{ Odd Wt.} \\
 \hline
 \end{array}$$

47706 Answer.

Here I say, 12 times 5 is 60
 &c. and take in the odd
 Weight at last.

A Quicker Way.

Hundreds, Quarters, and Pounds may be speedily
 reduced into Pounds, thus : Set down the gross Hund-
 reds, four several Times, in the Form following,
 and take in the odd Weight, as above.

C. qrs. lb.

In 24 3 26

24

24

24

110 Odd Weight.

Anfw. 2798 Pounds as above.

Here

Here is nothing to do but to set the Hundreds down as before, with the odd Weight, and add them together, and therefore it is the shortest Way of all others to reduce Hundreds gross into Pounds.

More Examples.

In C. 27 3 19 how many Pounds?

$ \begin{array}{r} 27 \\ 27 \\ 27 \\ \hline 103 \text{ Odd Weight.} \\ \hline \end{array} $	$ \begin{array}{r} 112 \text{ lb. 1 C. Weight.} \\ 27 \\ \hline 784 \\ 224 \\ \hline 103 \text{ Odd Weight.} \\ \hline 3127 \end{array} $
Answer <u>3127</u> Pounds.	

In 1 Hoghead, qt. C. $7\frac{1}{2}$ 12 how many Pounds?

$$\begin{array}{r}
 7 \\
 7 \\
 7 \\
 \hline
 768 \text{ Odd Weight.} \\
 \hline
 \end{array}$$

Answer 852 Pounds.

C. grs. lb.

In 256 1 17 how many Pounds?

$$\begin{array}{r}
 256 \\
 256 \\
 \hline
 256,45 \text{ Odd Weight.} \\
 \hline
 \end{array}$$

Answer 28717 Pounds.

In 476 C. $\frac{1}{2}$ 24 lb. of Copper, how many Pounds?

Answer 53364

In C. 4 3 27 how many Pounds?

4
4
4
111 Odd Weight.
—
559 Answer.

112lb. 1 C. Wt.

4
—
448
111 Odd Weight.
—
559 Proof.

Examples at large.

In C. $9\frac{1}{2}$ 14lb of Indigo, how many Pounds?

112
—
1078 Answer.

In C $246\frac{3}{4}$ of Cotton Yarn, how many Pounds?
Answer 27636.

Tuns. C. grs. lb.

In 276 12 3 24 of Cheese, how many Pounds?
Answer 619692.

In 574859 Pounds of Copper, how many Tuns, &c.

Tuns. C. grs. lb.

Divide by 112, &c. Answer 256 12 2 19

In 426C. of Tobacco, how many boxes, each to weigh 12lb.
Answer 3976.

In C. 417 3 12 of Pimento, how many Casks, each C. $5\frac{1}{4}$ 20lb.
Answer 120.

In 242 Casks of Nutmegs, each 5 C. $\frac{1}{2}$, how many Ounces?
Answer 1517824

Suppose

Suppose 6 Oxen weigh C.38 2 8 how many Stone ?

Answer 540.

Turkish Silk of 24 Ounces to the Pound, is reduced to Pounds of 16 Ounces by adding $\frac{1}{2}$, because 8, the $\frac{1}{2}$ of 16, is the Difference between 16 and 24.

Example.

Reduce 756lb. of *Tripoli* Belladine Silk, of 24 Ounces to the Pound, to 16 Ounces to the Pound.

$$\begin{array}{r} 756 \\ 24 \\ \hline 3024 \\ 1512 \\ \hline \end{array}$$

Short Way.

$$\begin{array}{r} 756 \\ 378 \text{ The } \frac{1}{2} \text{ added} \\ \hline 1134 \text{ Answer.} \\ \hline \end{array}$$

16)18144(1134 Answer.

If I have C.155 3 22 of Beef for Sea Use, and to be cut in Pieces, viz. into $\frac{1}{2}$ Pound Pieces, Pound Pieces, Pound and $\frac{1}{2}$ Pieces, 2 Pound Pieces, 3 and 4 Pound Pieces, and of each of these Quantities an equal Number, i. e. as many Pieces of 4 Pounds each, as of Pieces of $\frac{1}{2}$ Pounds, &c. each, What is the Number ?

Ans. 1455 Pieces and $\frac{6}{11}$ or $\frac{1}{2}$ Piece of each Quantity.

T R O Y W E I G H T.

lb. oz. dwt. gr.

In 212 10 17 22 how many Grains ?

12 Ounces 1 Pound.

2554 Ounces
20 dwt. 1 Ounce.

51097 Penny weights.
24 Grains 1 dwt.

204390
102196

1226350 Grains, Answer.

In 1226350 Grains how many Pounds, &c.

24)1226350(	2 0)
120....	5109 7
26	12)2554 17
24	lb. 212 10 17 22
235	
210	
190	
168	
(22)	

In 246 Ingots of Silver, each weighing 4lb. $\frac{1}{2}$ Troy, how many Ounces?

Answer 13284 Oz.

Out of 79680 Oz. of Silver how many Snuff Boxes may be made, each to weigh 3 oz. $\frac{3}{4}$?

Answer 21237 Boxes, $\frac{2}{3}$ or $\frac{3}{4}$.

What Quantity of Gold must there be to make 674 Funeral Rings, each to weigh 3 dwt. 12 grains.

Answer 1170z. 19dwt.

In 47624 Bars of *Spanish* Silver, each 36 Oz. $\frac{1}{4}$, how many Ounces?

Answer 1726370 Oz.

How many Tankards each to weigh 19 Oz. $\frac{1}{2}$ of Silver, may be made out of 8658 Oz.

Answer 444 Tankards.

CLOTH

CLOTH MEASURE.

Yds. qrs. Nls.

In 246 3 2. how many Nails ?

4 qrs. 1 Yard.

987

4 Nails 1 Quarter.

Answer 3950 Nails.

In 425 Ells *Flemish*, how many Ells *Eng*?

3 qrs. 1 Ell *Flem*.

5 qrs. 1 Ell } 5) ———
English. } 1278 qrs.

Eng. Ells. 255 $\frac{3}{4}$ *Ans.*

Or you may multiply by 6 Half Quarters, and divide by 10 Half-Quarters, which is shorter; because in dividing by 20, you only cut off a Figure from the Dividend, and the Work is done.

In 5426 Ells *Flemish* how many Yards?

3

4)16278

Ans. 4069 $\frac{3}{4}$ or $\frac{1}{2}$ a Yard.

In 376 *French* Aulms or Ells, how many Yards?

6 qrs. 1 *French* Aulm.

4)2256

564 Yards, Answer.

In 47290 Ells *Flemish* how many Ells *Eng.* and Yards?

Answer 28374 Ells *Eng.* 35467 Yds. $\frac{1}{2}$.

In 40 Score of *Flemish* Ells, how many Ells of *French*?

'Twas given by a Prodigal unto a saucy Wench.

Answer 400 Ells *French*.

In 564 Yards, how many Aulms ?

$$\begin{array}{r} 4 \\ \hline 6)2256 \end{array}$$

376 Answer and Proof, to 376 *French Aulms*
(foregoing.
Ells *English* are reduced into Yards by adding $\frac{1}{4}$.

More Examples.

In 426 Ells *English*, how many Yards ?
106 $2\frac{1}{2}$ the $\frac{1}{4}$ to be added.

532-2 *Facit.*

On the contrary, Yards are brought into Ells *English*
by subtracting $\frac{1}{4}$

In 532 Yards $\frac{1}{2}$ how many Ells *English* ?
106 the $\frac{1}{4}$ to be subtracted.

Answer 426 Ells *English*.

Ells *Flemish* are brought into Yards by deducting $\frac{1}{4}$.
In 5960 Ells *Flemish*, how many Yards ?
1490 the $\frac{1}{4}$ to be subtracted.

Answer 4470 Yards.

Yards are reduced into Ells *Flemish* by adding $\frac{1}{4}$.
In 4470 Yards, how many Ells *Flemish* ?
1490 the $\frac{1}{4}$ to be added.

Answer 5960

In 45 Packs of Cloth each 45 Pieces, and each
Piece 45 Ells *Flemish*, how many Ells *English* and
Yards.

Answer 54675 Ells.
68343 $\frac{3}{4}$ Yards.
Ells

Chap. 6. R E D U C T I O N. 155

Ells *Flemish* are brought into Ells *English*, as expressed before, viz. by multiplying by 6, and dividing by 10; or cutting off the last Figure or Cypher.

In 4920 Ells *Flemish*, how many Ells *English*?

$$\begin{array}{r} \text{---} \\ 10 \overline{) 4920} \\ \text{---} \end{array}$$

Ans. 2952 Ells *English*.

Ells *English* are reduced into Ells *Flemish* by adding a Cypher, and dividing by 6, or by adding $\frac{2}{3}$.

In 4726 Ells *English* how many Ells *Flemish*?

$$\begin{array}{r} 6 \overline{) 47260} \\ \text{---} \end{array}$$

Ans. 7876 $\frac{4}{6}$ or $\frac{2}{3}$ Ells *Flem.*

Or thus :

$$\begin{array}{r} 4726 \quad \left. \begin{array}{l} \\ 1575 \frac{1}{3} \\ 1575 \frac{1}{3} \end{array} \right\} \begin{array}{l} \text{The } \frac{2}{3} \\ \text{to be added.} \end{array} \\ \text{---} \end{array}$$

As before 7876 $\frac{2}{3}$

L I Q U I D M E A S U R E.

Tuns. Hhds. Gal.

In 65 2 24 how many Pints of Wine?
4 Hhds. a Tun.

262 Hhds.

63 Gall. 1 Hoghead.

790

1574

16530 Gallons.

8 Pints 1 Gallon.

132240 Pints, Answer.

8)

In 132240 Pints of Wine, how many Tuns, &c.

$$\begin{array}{r}
 \text{63)16530(262 Hogsheads.} \\
 \text{126 .. — Hhds. Gallons.} \\
 \text{—T. 65 2 24}
 \end{array}$$

$$\begin{array}{r}
 393 \\
 378 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 150 \\
 126 \\
 \hline
 \end{array}$$

(24)

In 20 Tuns of Beer, how many Quarts?
4 Hogsheads : Tun.

$$\begin{array}{r}
 80 \\
 54 \text{ Gall. 1 Hogshead of Beer.} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 320 \\
 400 \\
 \hline
 \end{array}$$

4320 Gallons.
4 Quarts : 1 Gallon.

17280 Quarts, Answer.

54 Gallons make a Hogshead of Beer, therefore to bring Firkins into Hogsheads, take $\frac{1}{6}$ Part, or divide by 6, and it quotes Hogsheads, because 6 times 9, the Gallons in a Firkin make 54.

To bring Hogsheads into Barrels, add $\frac{1}{2}$, because 18, the $\frac{1}{2}$ of a Barrel, and 36 the whole make 54, the Hogshead. To bring Kilderkins into Hogsheads, divide by 3, because 3 times 18 make 54. Barrels are brought into Tuns, by dividing by 7, as follows,

7)

In 420 Barrels, how many Tuns?

$$\begin{array}{r}
 60
 \end{array}$$

*In 40 Butts of curious Beer, by People called Stout,
How many Quarts may thence be drawn, before those
Butts are out?*

Answer 17280.

Examples

Admit a Ship's Cargo from the *Canaries*, to be, *viz.*
250 Pipes, 130 Hogsheds, and 150 Quarter-Casks;
how many Gallons in all; and allowing every Pint to
be a Pound, what is the Weight also?

Answer 44415 Gallons, 158 Tuns, 12C. $\frac{1}{2}$.

In 444 Firkins of Ale, how many Pints?

Answer 28416.

In 74640 Pints of Beer, how many Barrels?

Answer 259 $\frac{6}{18}$.

In 45 Fats, or Vates of Rhenish Wine, each of 242
Gallons, how many *Aum* Casks each 42 Gallons?

Answer 259 $\frac{1}{2}$.

Note, *Rhenish Wine is sold by the Aum, of about 42 Gal.*

In 57 Pipes and 42 Gallons of *Madeira Wine*, how
many Puncheons, Hogsheds, and Tierces?

Answer 86 Pun. 115 Hhds. 42 Gal. 172 Tier.

*In 40 Tuns, and 50 Butts, and 60 Pipes of Wine,
How many Tierces do they make, admit they came from
Rhine.*

Answer 570.

DRY MEASURE.

Lasts, qrs. Bush. Gall.

In 24 7 6 2 how many Gallons of Wheat?
10 Quarters 1 Last.

247 Quarters.

8 Bush. 1 Quarter.

1982 Bushels.

8 Gallons 1 Bush.

15858 Gallons.

In 40 Lasts of Barley, how many Combs?

Answer 800.

In 3228 Fats, or Vates of Sea Coal, how many Chaldrons and Scores?

Answer $\left\{ \begin{array}{l} 807 \text{ Chaldrons.} \\ 30\frac{1}{2} \text{ Scores.} \end{array} \right.$

In 33 Weyes of Salt, how many Quarters, Bushels, and Pecks?

Answer $\left\{ \begin{array}{l} 165 \text{ Quarters.} \\ 1320 \text{ Bushels.} \\ 5280 \text{ Pecks.} \end{array} \right.$

In 20 Lasts and 30 Weyes of Corn, that's called Rye, How many Bushels do they make, if you buy by Bushel buy?

Answer 2800 Bushels.

In 38880 Pecks of Sea-Coal, how many Chaldrons?

Answer 270.

LONG MEASURE.

In 50 Miles, how many Barley Corns in Length?
8 Furlongs 1 Mile.

400 Furlongs.
220 Yards 1 Furlong.

8000
800

88000 Yards.
3 Fect 1 Yard.

264000
12 Inches 1 Foot.

3168000 Inches.
3 Barley Corns 1 Inch.

9504000 Barley Corns in 50 Miles.

In 17490 Square Poles, how many Acres, &c
 $16\overline{)17490}$ 109 Acres.
 16...

$$\begin{array}{r} 149 \\ 144 \\ \hline \end{array}$$

$$\begin{array}{r} 40 \overline{) 50} 1 \text{ Rood.} \\ 4 \cdot \end{array}$$

Acr. Rood. Poles

(10) Answ. 109 1 10

Here is a small Name to be brought into a great, and therefore it is performed by *Division*; wherefore I divide the Square Poles by 160, the Square Poles in an Acre, and the Quotient is Acres, and the Remainder is Poles, which I divide by 40, the Square Poles in a Rood, and there comes but one Rood, or $\frac{1}{4}$ of an Acre, and 10 Poles remain. So the whole is 109 Acres, 1 Rood, and 10 Poles, as by the Work above.

T I M E.

I desire to know how many Days, Hours and Minutes, there are since the Birth of our Saviour to this present Year.

1734?
 365 Days in a Year.

$$\begin{array}{r} 1734 \\ 6 \text{ Hours wanting.} \\ \hline 10404 \text{ Hours added} \\ \hline \end{array}$$

$$\begin{array}{r} 8670 \\ 10404 \\ 5202 \\ \hline 832910 \text{ Days.} \\ 24 \text{ Hours in a Day,} \end{array}$$

Anno 1734. When an Edition of this Book was printed, and the altering the Date, would have been altering all the Work,

$$\begin{array}{r} 2531640 \\ 1265820 \\ \hline 15189840 \\ 10404 \text{ Hours added.} \\ \hline 15200244 \text{ Hours.} \\ 60 \text{ Min. in an Hour.} \end{array}$$

$$\begin{array}{r} 912014640 \text{ Minutes.} \end{array}$$

Here

Here in regard that there are 6 Hours lost every Year, (for the Year consists of 365 Days, 6 Hours nearly) I multiply the Years by 6, which produces 10404 Hours to be added to the Product of Hours.

Or it may be done thus: Bring a Year into Hours, in which you will find 8766, by which multiply that Number of Years; and that Product by 60, and the last Product will be the Answer; as by the following Work.

Days. Hours.

365 6 a Year.
24 Hours 1 Day.

1466

730

8766

1734 Years.

8766 Hours in a Year.

10404

10404

12138

13872

15200244 Hours since.
60

912014640 Minutes since.

From the 6th of *June* 1682, to the 15th of *August*, exclusive, 1721, how many Days; adding 9 Days for the Leap-Years, being 1 Day every 4th Year?

Answer 14323.

From the 19th of *August* 1701, to the 21st of *January* exclusive, 1717, (noting the Leap-Year) how many Days?

Answer 5998.

Here follow some Questions, promiscuously set for the Exercise of the Learner's Ability.

In 305*l.* 12*s.* 7*d.* how many Halfpence? Answer 146702.

In 3192*lb.* Weight, how many Hundred Weight? Answer 28*C.* $\frac{1}{2}$.

In 3*C.* $\frac{1}{4}$ of *Tobacco*, how many 12*lb.* Boxes? Answer 35.

In

In 270lb. 11oz. 12dwt. how many Penny Weights?

Answer 65032.

In 730 Rix Dollars at 4s. 5d. $\frac{3}{4}$, how many Ducats at 4s. 4d.? Answer 754 $\frac{118}{108}$ or 2s. 5d. $\frac{1}{2}$ over.

In 3lb. 10oz of Gold, how many Mourning Rings, each 2dwt. 12Grains? Answer 368

In 1260 Quarts, how many Hogsheads of Wine?

Answer 5 Hogsheads.

In 60 Kintals of Pruans, how many C. Weight, (a Kintal being 100lb.) Answer 53C 2qrs. 8lb.

In 506lb. 12s. 2d how many Portugal Reas at 20 for 3d? Answer 810560 $\frac{2}{3}$.

In 56 Boxes of Sugar, each 2C. $\frac{3}{4}$, how many C. Weight? Answer 154

In 4679 Yards, how many Ells Eng. Anf. 3743 $\frac{1}{5}$.

In 86l. how many Guineas at 21s. 6d?

Anf. 80 Guineas.

In 88000 Yards, how many Miles? Answer 50

In 14703 Ells *Flemish*, how many Yards?

Answer 11027 $\frac{1}{4}$ Yards.

In 75C. 3qrs. 24lb how many Pounds? Anf. 8504lb.

In 176C. 2qrs. 24lb Sugar at *Jamaica*, (the C. Weight being 100lb.) how many C. Weight at *London*, the C. Weight being 112? Anf. 157C, 3qrs. 6lb.

In 6000 *French Crowns*, at 57d. each, how many Pounds Sterling? Answer 1425.

In 34lb. 6oz. *Troy*, how many Ounces?

Answer 414 Ounces.

In Guineas 90, and in Pistoles nine

How many Pence, and what Sterling in Coin?

The Guineas at 21s. } Answer 24516 Pence,
and Pistoles at 17s } or 102l. 3s.

In 46 Packs of Cloth, each Pack 24 Pieces, and each Piece 42 Ells *Flemish* how many Ells *English* and Yards?

Answer 27820 $\frac{1}{2}$ Engl. Ells, and 34776 Yards.

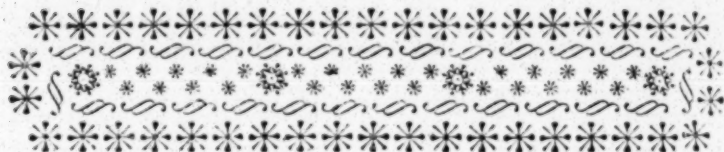
How

How many times does a regular Clock strike in a Year?

Answer 56940.

In 15420 *Vares* of *Valentia*, 100 of which make 85 Yards *English*, how many Yards and Ells *English*?

Answer 13090 $\frac{2}{3}$ or $1\frac{4}{7}$ Yds. and 10472 Ells *English*.



C H A P. VII.

of T A R E and T R E T, &c.

GROSS WEIGHT is the Weight of a Commodity, with the Weight of the Hoghead Chest, Cask, Box, Wrapper, or any Thing else that contains the Goods: Or any Quantity given in *Hundreds*, *Quarters*, and *Pounds* in *Gross Weight*.

TARE is an Allowance made by the Seller to the Buyer, for the Weight of the Hoghead, Cask, Chest, Box, Bag, &c. wherein the Goods are contained. And is sometimes reckoned at so much *per Bale*, *Bag*, *Barrel*, *Chest*, &c. As in *Silks*, *Cotton*, *Raisins*, *Capers*, At other Times at so much *per C.* as 10, 14, 16, or 24*lb.* *per C.* There is also a Distinction of *Custom-House*, and *Invoice Tare*, as in *Tobacco's* and *Indigo's* &c. and sometimes uncertain, as in *Tobacco's* and *Sugars*, happening according to the Size of the Casks.

TRET is an Allowance of 4*lb.* upon every 104*lb.* *Suttle*, claimed by *Freemen of London* (and sometimes to others also) and this is allowed for Waste and Dust, on some Sorts of Goods; as on *Tobacco's*, *Spices*, *Drugs*, &c.

CLOFF

CLOFF is an Allowance of 2*lb.* upon every Draught above 3*C.* Weight to the Citizens of *London*.

Neat Weight is what remains when the Allowances are deducted.

Example.

In 29 Bags of *Hops*, containing *Gross* 88*C.* 1*qr.* 19*lb.*
Tare 4*lb.* per *C.* how many *C.* neat?

	<i>C.</i>	<i>qrs.</i>	<i>lb.</i>
<i>Gross</i>	88	1	19
<i>Tare</i>	3	9	17
<i>Neat</i>	85	1	02

	<i>C.</i>	<i>qrs.</i>	<i>lb.</i>
	88	1	19
	4 <i>lb.</i> per <i>C.</i>		
112)	353	<i>Tare</i> (3 <i>C.</i>	
	336		
	(17)		

I multiply the given Hundred by 4, the *Tare* allowed for each Hundred, which produces, with 1*lb.* allowed for the Quarter, 353*lb.* *Tare*, which I divide by 112, and the Quotient gives 3*C.* Weight, and 17*lb.* remains, which I subtract from the *Gross Weight*, and the Remainder is *C.* 85 1 02 for the *Neat Weight*. See the *Work*.

When the *Tare* is at so much per *C.* Wt. multiply the *Gross Weight* by the *Tare*, and divide the Product by 112, and the Quotient will be the *Tare*. Or subtract the *Tare* per *C.* from 112, and the Remainder multiply the *Gross Weight*, and the Product divide by 112, and the Quotient will be the neat Weight. Or if you multiply the Pounds *Gross* by the Pounds *Tare*, and divide by 112, the Quotient gives the Pounds *Tare*.

In 7 Bags of *Cotton*, each 2 *C.* $\frac{1}{2}$, *Tare* 7*lb.* per Bag, how many Pounds neat?

2 $\frac{1}{2}$ *C.*

2½ C. each

7 Bags.

7

7 lb. Tare each.

17½

49 lb. Tare.

17

17

17.56 the ½ C.

From 1960 lb. Gross.

Subtract 49 lb. Tare.

Answ. 1911 lb. Neat.

In 27 Bags of Pepper, containing,

4 lb. Bag } Gross

C. qrs. lb.

Tare }

58 3 11 Tare 4 lb. per Bag.

108 lb. Tare.

58

58

58.95 for 3 qrs. 11 lb.

[How many Pounds 6591 Pounds Gross.
Neat ?] 108 Tare.

Answ. 6483 Pounds Neat.

Three Hogheads of Tobacco, Wt. viz.

No. 1 C5 1 17 Tare 90 lb.

2 6 2 10 — 87

3 5 3 20 — 85

17 3 19 — 262

17

17

[How many Pounds neat ?]

17

103 Odd Weight.

2007 Gross Weight.

262 Pounds Tare.

Answer. 1745 Pounds Neat.

Four

Chap. 7. TARE and TRET. 165

Four Barrels of Indigo, qt. viz.

		C. qrs. lb.		lb.
No.	{	1 qt. 4	1	10 Tare 36
		2	3	3 20 — 29
		3	4	0 19 — 32
		4	4	0 00 — 35

How many Pounds neat? 16 1 21 — 132

Answer lb. 1709

Six Hogsheads of Tobacco, Wt. viz.

		C. qrs. lb.		lb.
Tret 4lb per 104lb. and Cloff 12lb. How many Pounds neat?		4	3	21 Tare 76
		5	2	17 — 96
		6	1	20 — 100
		4	3	24 — 84
		7	1	13 — 132
		5	2	26 — 98

The Tret is always
found by dividing the
Suttle Pounds by 26;
because 4 times 26
is 104.

lb.
26)3373(129½
26 ..

77

52

253

234

(19)

The Half-Pound in the Tret is allowed for the 19
Pound remaining.

Gross 35 0 09 — 556
35
35
35.9

3929 Pounds Gross.
556 Pounds Tare.

3373 Pounds Suttle.
129½ Pounds Tret.

3243½ Rest.
12 Cloff.

Answer 3231½ Neat Weight.

In

In five Barrels of *Nutmegs* Wt. 18C. $\frac{1}{2}$, 07lb. *Gross*,
Tare 30 Pounds *per* Barrel ; and *Tret* 4 Pound *per*
 104lb. how many Pounds neat ?

	C.	qrs.	lb.
30lb. Tare	18	2	07 Gross.
5 Barrels	18		
—	18		
150 Tare	18,63		
	2079	Pounds	Gross.
150 Tare	26	1929	(74lb. Tret.
1929 Rest		182	.
74 Tret		—	—
—		109	
1855 Answer		104	
—			

(5)

When the *Tare* is at so many Pounds *per Cent.* or 112lb. if it happen to be any Part of a Hundred Weight, it may be sooner done by dividing the *Gross Weight* by that Part, according to the Rule of *Division* of several Denominations : As admit it be at 14lb. *Tare per Cent.* then take the 8th Part of the *Gross Weight*, or divide it by 8, because 14lb is the 8th Part of a Hundred Weight, and the Quotient will be the *Tare in Gross Weight*, which subtract from the first *Gross Weight*, and the Remainder will be the *Neat Weight*.

Example.

	C.	qrs.	lb.
20 Bags, qt. (8) 48	1	24	Gross, Tare 14lb. per C.
—	6	0	06½ Tare.
—			
Facit C. 42	0	17½	neat Weight.

Here I say, the Eights in 48, 6 times ; then the Eights in 1, 0 times, but turning it into Pounds, that is 28, and

24 in the Place of Pounds make 52; then the Eights in 52, 6 times, and there rests 4, which I multiply by 4, the Quarters in a Pound, and they make 16; then the Eights in 16, twice, or $\frac{1}{2}$, a Pound. So the Tare is 6C 0qrs. 06lb. $\frac{1}{2}$, which I subtract from 48C. 17r. 24lb. and the Remainder 42C. 0qrs. 17lb. $\frac{1}{2}$, for the Neat Weight; as by the Work above.

If the Tare be 16lb. per Cent, then divide the Gross Weight by 7, because 16lb. is the 7th Part of a Hundred Weight.

Example.

12 Hhds 5 C. qrs. lb.
 qt. (7 59 3 14 at 16lb. per Cent.

Tare 8 2 06 the 7th Part.

Neat Wt. 51 1 08

If the Tare be 18lb. per Cent, then for 16 Pounds work as in the last Example; and for the two Pounds take the 8th Part of the Quotient, and add them together for the whole Tare.

If the Tare be 20lb. per Cent, then for the 16 Pounds work as before; and for the 4 Pounds, take the 4th Part of the Quotient, and add them together for the whole Tare.

If the Tare be 8, 10, or 12lb. per Cent. or any lesser Number; then take the Half of the Gross Weight, which will make it Half Hundreds; then 8lb. is the 7th Part of $\frac{1}{2}$ C. 10lb. is divided into the 7th Part, and 4th of that 7th Part; 12lb. into the 7th Part, and Half of that Part, &c

Oil is entred at the Custom-House by the Gallon, and pays Duty accordingly; yet in uncertain Casks it is weighed and the Tare allowed is 18lb. per C. which being deducted, is computed at 7lb. $\frac{1}{2}$ per Gallon; and reduced

reduced thus: Multiply by 94, (that being the Neat Weight of 112) and the Product is the Neat Pounds, which doubled brings them into Half Pounds, which divide by 15, the Half Pounds in 7 Gallons and $\frac{1}{2}$, the Quotient gives the Content in Gallons, which if divided by 252, gives Tuns, &c.

Example

$$\begin{array}{r}
 \text{C. qrs. lb.} \\
 \text{Reduce } 124 \quad 3 \quad 16 \text{ into Gallons.} \\
 94 \\
 \hline
 496 \\
 1116 \\
 100 \\
 \hline
 11756 \text{ Pounds.} \\
 2 \\
 \hline
 \end{array}$$

Half Pounds 15)23512(1567 $\frac{1}{3}$ Gallons.

Oil in certain Casks, 1 in 20 is allowed for Leakidge, but under 10 none.

In *Candy* Barrels the Tare is 29lb. per Barrel; and from *New-England* 50lb. per Barrel.

In 46C. of *Pruans*, Tare 16lb. how many C. Neat?

Answer 39C 1qr. 20lb.

Admit

Chap.
Ad
tain

Or
tipling
Produ
the Ne

Tare
of Suga
from

Oil 18
Madde

Tar
Ditto i
10lb
Man

foregoi
improv

Chap. 7. TARE and TRET. 169

Admit 50 Barrels of Oil from New-England, to contain

122 C. 3qrs. 12lb
 122
 122
 122,96

13760 Pounds.
 2500 Tare.

11260 Neat.
 11260

15)22520 Half Pounds.

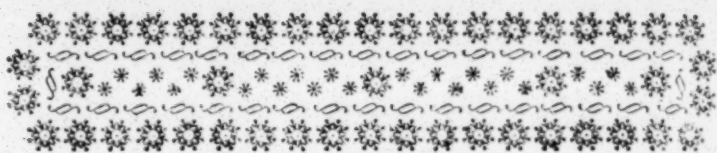
Ans. $150 \frac{1}{3}$ Gallons.

Or Pounds of Oil are reduced into Gallons by multiplying the Neat Pounds by 2, and dividing that Product by 3; and that Quotient again by 5, gives the Neat Gallons of 7lb $\frac{1}{2}$ per Gallon.

TARE S.

	C.		C.	Alom in Casks 12lb per C.
Tare	{ 8 }	to	{ 12 }	1 Pot-Ashes 10 ditto
of Sugars	{ 12 }		{ 15 }	$1\frac{1}{4}$ Argil or Argol
from	{ 15 }		{ 17 }	in Casks, } 14 ditto.
				Almonds in Bags, 14 ditto.
Oil 18lb. per C.				Raisins in
Madder in Bales, 28lb.				Frails or } 14lb. per
Tare per Bale,				Baskets. } Frail.
Ditto in Fats, or Vates,				
10lb. per C.				

Many more Examples might be offered, but those foregoing I think are sufficient for the Service and improvement of any ingenious Person.



C H A P. VIII.

*The GOLDEN RULE.**Or Rule of Three Direct.*

THIS is called the *Rule of Three*, from its having Three Numbers to work with to find a Fourth in Proportion to them; which Fourth Number is the Answer to the Question.

It is also called the *Golden Rule*, from its excellent Use and Performance in *Arithmetic*.

And sometimes the *Rule of Proportion*, because the Fourth Number bears the same Rate or Reason to the Third, as the second does to the First.

I. Observe that of the three given Numbers in any Question in this *Rule*, you have two of them always of one Name, or Kind; that is, if one be *Money* so is the other; or if one be *Weight*, the other is so also: And one of which Numbers must be the First Number in stating, and the other the Third, and that must always be the Third which moves the Question, and the other of the same Kind, must be the First Number; and the other Number, which is of another Denomination, always possesses the middle Place, and is evermore of the same Kind with the Answer, or Fourth Number sought. As for *Example*.

If 12 Ells of *Holland* cost 36*s*. what will 456 Ells cost at that Rate?

Here in stating the Question for the Work 456 must be the third Number; because that is the Number that asketh the Question; for 'tis required to know what will

456

456 Ells cost? And the other Number of the same Name, is to be the first, which here is 12; and the last Number, which is, of the same Kind with the Number sought, or Answer to the Question, possesses the middle Place, and when stated for the Working stands thus:

<i>Ells</i>	<i>s.</i>	<i>Ells.</i>
12	36	456

If 12 cost 36 what 456?

II. When ever it happens, that either one or both of the extreme Numbers, be of divers Denominations, they must be reduced into the lowest Name mentioned; that is, if they be Pounds, Shillings, and Pence, or C. qrs. and lb. then they must be reduced into Pence, or Pounds Weight. And if one of the Extremes be of several Denominations, and not the other, yet must both be reduced into one Name; that is, if one consists of Pounds, Shillings, and Pence and the other only of Pounds, yet that Number which is only Pounds, must be brought into Pence as well as the other, that the first and third Numbers may be of like Name, which always must be; that is, if the first Number be Feet, the third Number must be Feet likewise; and if one be Gallons, the other must be Gallons also, &c. as was said before. If the middle Number be of divers Denominations, it must be reduced into the lowest Name mentioned therein, (or lower if there's Occasion) as well as the first or third Numbers.

III. When the Numbers are disposed in such Order, as before directed, and stated accordingly, then multiply the second, and third Numbers together; that is the third by the second, or the second by the third, (it being all one) and divide that Product by the first Number, and the Quotient of that Division will be the Answer, and in the same Name with the middle Number; that is, if the middle Number be Shillings, so will the Quotient also. Or if the middle Number be Pence, or Farthings, so likewise will be the Quotient, or Answer.

For the better understanding the foregoing Notes and Directions, I shall comprise them under those short Heads following, *viz*

1. That must be the third Number, which asketh the Question.

2. First and third Numbers must be of one Name, or so reduced.

3. The middle Number, if of divers Denominations, must be brought into the lowest mentioned; or lower, if Occasion require it.

4. Multiply the second and third Numbers together, and divide that Product by the first Number, and the Quotient thence arising, will be the Answer to the Question, in the same Name you left your middle Number in.

The fourth Number, or answer to the Question, if in a direct Proportion, may be found these three several Ways, *viz*.

(1) By multiplying the second and third Numbers together, and dividing the Product by the first, and the Quotient will be the Answer: As in the 4th Direction above.

(2) By dividing the second Number by the first, and then multiplying that Quotient by the third, and that Product will be the Number sought.

(3) By dividing the third by the first, and then multiplying that Quotient into the second Number, and that Product will be the Answer.

Tho' all these Ways be equally true, and the two last very concise, when either the second or third Terms may be divided by the first, yet the first is most in use.

N. B. *When the first Term is an Unit, the Answer is found by Multiplication only. When the second or third Term is an Unit, then the Answer will be found by Division only*

Example

Example 1.

If 12 Ells of *Holland* cost 36 Shillings, what will 456 Ells cost at that Rate?

The Numbers being ranked according to the Directions given in the first Rule of this Chapter, they stand thus:

<i>Ells.</i>	<i>s.</i>	<i>Ells.</i>
If 12 cost	36, what	456?
		36 Second Number,
		2736 1368
The first Number, 12)		16416
		2 0) 136 8
		Answer <i>l.</i> 68 08

Here (according to Rule) I multiply the third Number 456 by 36, the second Number, and the Product is 16416, which I divide by 12, the first Number, and the Quotient is 1368, which are so many Shillings; because the middle Number was left in Shillings: Then those Shillings in the Quotient I bring into Pounds, according to the Rule given in *Reduction*, page 129, by cutting off the Figure towards the right Hand, and halving those towards the left, and the Answer is 68*l.* 8*s.* as may be seen in the Work above.

Example 2.

If 456 Ells of *Holland* cost 68*l.* 8*s.* what will 12 Ells cost at that Rate? *Stated thus as follows:*

I 2

Ells

Ells. l. s. Ells.
If 456 cost 68 8. what 12?

20

1368

12 Third Number.

First Number 456)16416(36s. Answer.

1368

2736

2736

(o)

Here the Question lies upon 12 Ells ; for it is asked, *What will 12 Ells cost ?* Therefore in the stating it is the third Number, (as it is also in the Question, but sometimes it does not so happen, that the Numbers in a Question lie in such Order as they ought to do in stating) and the other of the same Name is the first, viz. 456 ; and the middle Number is of the same Name you seek for, viz. Money, for we want to know how much Money 12 Ells will cost ; but here the middle Number is of more Denominations than one, viz. of Pounds and Shillings ; and therefore it is brought into the lowest Name mentioned, to wit, Shillings. Then I multiply the second and third Numbers together, and divide their Product by the first, and the Quotient is the Answer, viz. 36s. and is a Proof to the first *Example*. And so may any Question be proved by stating it reversely, or otherwise varying the Question several Ways.

IV. If after you have divided the Product of the second and third Numbers, multiplied together by the first Number, any thing remains, the Value of that Remainder may be found, by multiplying the said Remainder by the Parts of the next inferior Denomination, that are equal to one of the Quotient : That is suppose the Quotient is Shillings, and there is a Remainder, that Remainder must be multiplied by 12, because

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because 12 of them, *viz.* Pence (the next lower Denomination) make one of the Quotient, to wit, a Shilling, and divide that Product by your former Divisor the first Number, and the Quotient will be the Value of that Remainder, in the Parts aforesaid. And if any yet remain, it must be multiplied by the Parts of the next inferior Denomination, that are equal to an Unit of the last Quotient, and still divide by the same Divisor, &c. And so must you proceed till nothing remains, or till you have brought it as low as you desire.

Example 3.

If one Hundred Weight of Currants cost 2*l.* 9*s.* 6*d.* what will 45*C.* 3*qrs.* 14*lb.* cost at that Rate? *State as follows.* Not work'd in this Page but in 176.

I 3

If

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lb. l. s. d. C. qrs. lb.
If 112 cost 2 9 6 what 45 3 14?

$$\begin{array}{r} 20 \\ \hline 49 \\ 12 \\ \hline \end{array} \quad \begin{array}{r} 4 \\ \hline 183 \\ 28 \\ \hline \end{array}$$

$$\begin{array}{r} 594 \text{ 2d Num.} \\ \hline 1468 \\ 367 \\ \hline \end{array}$$

5138 Third Number.
594 Second Number.

$$\begin{array}{r} 20552 \\ 46242 \\ 25690 \\ \hline \end{array}$$

The first Number 112) 3051972 (27249 Pence.

$$\begin{array}{r} 224 \dots \dots \dots \\ \hline 2|0)227|0-9d. \end{array}$$

$$\begin{array}{r} 811 \\ 784 \text{ Anf. l. 113-10-9d. } \frac{3}{4}. \end{array}$$

$$\begin{array}{r} 279 \\ 224 \\ \hline \end{array}$$

$$\begin{array}{r} 557 \\ 448 \\ \hline \end{array}$$

$$\begin{array}{r} 1092 \\ 1008 \\ \hline \end{array}$$

84 Remainder.
4

$$\begin{array}{r} 112)336(\frac{3}{4} \\ 336 \\ \hline (0) \end{array}$$

Here

Here the third Number is brought into the lowest Name mentioned, *viz.* Pounds; therefore the first Number, 1 Hundred Weight, must be in Pounds also. Likewise the middle Number is brought into the lowest Name mentioned in that. Then the second and third Numbers are multiplied together, and that Product divided by the first; and the Quotient is Pence because the middle Number was reduced into Pence then the Pence in the Quotient are brought into Pounds by *Reduction*; and they make 113*l.* 10*s.* 9*d.* But there is a Remainder of 84; wherefore I conclude that makes something more; therefore I multiply that Remainder by 4, the Parts of the next inferior Denomination, and divide that Product by the former Divisor, *viz.* 112, and it quotes 3, which is three Farthings, and nothing remains. So that the whole is 113*l.* 10*s.* 9*d.* $\frac{3}{4}$. See the Work.

I 4

Example

Example 4.

If 15 Weeks Pay comes to 2*l.* 12*s.* 6*d.* what is that a-Year? *Stated thus:*

Weeks. *l.* *s.* *d.* *Weeks.*
If 15 give 2 12 6, what 52?

20

52

12

630 2d Number.

52 3d Number.

1260

3150

12)

1st Number 15)32760(2184 Pence.

30...

2|0)18|2

27

15

1. 9 2

126

120

60

60.

(0)

Example

Example 5.

If one Ounce of Silver be valued at 5s. 2d. what is the Value of 240 Ounces 15 dwt.

If 10z. cost 5s. 2d. what 240oz. 15dwt.

$$\begin{array}{r} 20 \quad \frac{1\frac{1}{2}}{8\frac{1}{2}} \quad 20 \\ \hline \end{array}$$

20 Penny Wts.

4815 Penny Weights.

62, 2d Number.

$$\begin{array}{r} 9630 \\ 28890 \\ \hline \end{array}$$

1st Number, 210)29853'0

10 Rem.

4 Farth.

$$12)14926\frac{10}{8}$$

$$210)12413\ 10d.$$

$$20)410$$

$$\text{Answ. } l. 62-3-10\frac{1}{2}$$

2 qrs.

Example 6.

If a Tun of Wine cost 56lb. 14s. what costs a Quart?

Hbds.

l. s.

qt.

d.

If 4

56.14

1 1008)13608)13 $\frac{1}{2}$ Ans.

63

20

1008.

252

1134

3528

4

12

3024

1008 qts.

13608 Pence.

504

4

$$1008)2016(\frac{1}{2}$$

$$2016$$

(0)

15

Here

Here the middle Number is reduced lower than is mentioned, that being but Shillings, but I have brought it into Pence, because I would have the Answer the sooner, by not having so many Remainders to reduce lower. Here also the second and third Numbers are not multiplied together because I would only produce the same Figures again; wherefore I only divide the second Number by the first, and the Quotient is the Answer in Pence, agreeable with the middle Number, and the Remainder 304, I multiply by 4, and divide again by 1008, according to the Rule, and the Quotient produces two Farthings more, to be joined to the 13*d.* so the Answer is 13*d.* $\frac{1}{2}$ the *Quart*, as by the Work may be seen.

Example 7.

Suppose my Salary by 73 Pounds a Year, what is that a Day?

Days. *l.* *Days.*
If 365 give 73 what 1?

$$\begin{array}{r}
 \text{---} \\
 365 \overline{) 1460} \text{ (4*s.* per Day Answer.} \\
 \underline{1460} \\
 (0)
 \end{array}$$

Here the Year is brought into Days, that the first Number may agree with the third; and here also, I do not multiply by 1, for the Reasons above said (for an Unit of itself neither multiplies nor divides) and I cannot divide 73 by 365, wherefore I bring the Pounds into a lower Denomination, *viz.* Shillings, or lower, if there be Occasion. Then I divide according to Rule, and the Quotient gives 4*s.* the Day for Answer agreeable to the second Assertion of *N. B.* in Page 160.

Example

Example 8.

Nutmegs at 4d. $\frac{1}{2}$ per Ounce, what is that the C. Wt.

oz. d. lb.
If 1 cost 4 $\frac{1}{2}$, what 112?

$$\begin{array}{r} 4 \\ \hline 18 \end{array} \quad \begin{array}{r} 16 \\ \hline 672 \\ \hline 112 \end{array}$$

1792 Ounces.
18 2d Number.

$$\begin{array}{r} 14336 \\ 1792 \\ \hline 4)32256(\\ \hline 12)8064 \\ \hline 2)06712 \end{array}$$

33-12 Answer.

Here the middle Number is reduced into the lowest Name mentioned, viz. Farthings, by which I multiply the third, and the Product is Farthings; and according to Rule, I should divide by the first Number, but the first Number being but 1, it neither multiplies nor divides, (as was said before) and therefore the Quotient, or 4th Number, is the same with the Product of the second and third, which is Farthings; because the second Number was Farthings, which are reduced into Pounds, as above.

I shall now shew that many times Questions in this Rule may be contracted, and much sooner wrought by another Method of working; that is, only by following the brief Methods of *Multiplication* and *Division*, sufficiently shewn in the 4th and 5th Chapters of this Book.

Example 9.

If 5 Gallons of Brandy cost 1*l.* 6*s.* 8*d.* what will 63 Gallons, or a Hoghead, cost at that Rate?

The common Way.

G. *l.* *s.* *d.* G.
If 5 — 1 6 8 — 63

20

26

12

320 2d Numb.

63 3d Numb.

960

1920

5)20160

12)4032 Pence.

210)3316

1. 16. 16. Answer.

The shorter Way.

G. *l.* *s.* *d.* G.
If 5 — 1 6 8 — 63

9

12 0 0

7

1st Numb. 5)84 0 0

Ans. 1. 16 16 0

In working by the shorter Way, I do not reduce the middle Number at all, but multiply according to the 14th Rule of the 4th Chapter of this Book, by 7 and 9, they multiplied together making the Quantity 63, which Product I divide by 5, the first Number, according to the 10th Rule of the 5th Chapter, and the Quotient is the Answer, viz. 16*l.* 16*s.* as in the common Way. Here in this short Method, the Rule of Stating and Working is followed, as in the common Way; for the second and third Numbers are multiplied together, and their Product divided by the first, but there is above 20 Figures difference between one Way and the other.

Example

Example 10.

If the Wages of 3 Weeks comes to 2*l.* 3*s.* 6*d.*, what is a Year's Wages at that Rate?

<i>Common Way.</i>					<i>Short Way.</i>				
<i>W.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>W.</i>	<i>W.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>W.</i>
If 3	2	03	6	—52	If 3	2	03	6	—52
		20						10	
		43				21	15	0	
		12						5	
									<i>W.</i>
				522 Second.		108	15	0	50
				52 3d. <i>l.</i> 2 03-6 M. by (2)		4	07	0	2
				1044		1st N. 3	113	02	0
				2610					52
				3)27144		Answer <i>l.</i> 37	14	0	
				12)904-8 Pence.					
				2 0)75 4					
				<i>l.</i> 37 14 Answer.					

After I have multiplied by 10, and by 5, which make Fifty, I multiply 2*l.* 3*s.* 6*d.* the middle Number, by 2, which is wanting, and add them together.

How many Yards were in that Piece of Cloth that cost *l.* 14-2-6, the Yard being valued at 7*s.* 6*d.*

Answer 39 Yards,

Example

Example 11.

If 56lb. of Coffee cost 21*l.* 11*s.* 6*d.* what will 3*lb.* cost at that Rate?

Common Way.

lb. *l.* *s.* *d.* lb.
If 56 — 21 11 8 — what 3?

20
—
431
12
—
5180 Second.
3 Third.
— 12)

56)15540(277
112 —
— 2/3 · 1 ½

434 —
392 *l.* 1 · 03 · 1 ½ *Answ.*

420
392
—

28 Remainder.
4
—

56)112(2
112
—
(0)

Shorter Way.

If 56 — 21 11 8 — 3
3

7)64 15 0
—
8) 9 05 0
—

Answ. l. 1. 03 1 ½

Here I divide by the first Number at twice, according to the 11th Rule of the Vth Chapter. Here is above 30 Figures Difference.

Example

Example 12.

If the Freight of a Ship be 529*l.* 11*s.* what must be given to A. B. for his $\frac{5}{32}$ Parts?

Pts. *l.* *s.* *Pts.*
If 32—give 529 11—what 5?

20
—
10591
5
— 20)
32)52955(16514
32 . . .

209
192
— Anf. *l.* 82 14 10 $\frac{4}{32}$, or $\frac{1}{8}$, or half a
175 (Farth.
160

— *Pts.* Short Way. *Pts.*
155 32—*l.* 529 11—5
128 5

Rem. 27
12

4)2647 15

32)324(10
32

8) 661 18 9

Anfw. *l.* 82 14 10 $\frac{1}{2}$ a Farth.

Rem. (4)

Here is almost 40 Figures
Difference.

For 3 Weeks Board I pay 11*s.* 3*d.* What is that
a Year? Answer *l.* 9 15

Example

Example 13.

If 72 C. of Starch cost 63l. what will 15 C. at that Rate ?

C. l. C
If 72——63——15

Work as usual, &c
Answer l. 13-2-6

Short Way.

C. l. C.
If 72——63——15
3
——
189
5
——
8)945
——
9)118 $\frac{1}{8}$ of a l.
——
l. 13 : 2 : 6

* * Note, If at any time we know what Part the second Number is of the first; the same Part also will the 4th Number (or Answer) be of the third. As for Example.

If 10s. gain 2s what 100l. Answer 20l.
Which is the 5th Part of 100, as 2 is of 10.

Another Short Way. °

There is another Way of contracting Questions in this Rule, viz. by dividing the third Number by the first, and by that Quotient to multiply the second, which Product or Products, will be the Answer; as in the following Examples.

Example

Example 14.

If 8 Yards of cloth cost 4*l.* 10*s.* 8*d.* what will 24 Yards cost at that Rate?

Common Way.

<i>Yards.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>Yards.</i>
If 8—	4	10	8	—24?

20

12

90

1088

24

4352

2176

8)26112

12)3264

2|0)27|2

Answ. *l.* 13 12

Second short Way.

<i>Yards.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>Yards.</i>
If 8—	4	10	8	—24(3

3

3

Answer *l.* 13 12 0

Here I divide 24, the third Number, by 8, the first Number, and it quotes 3; by which I multiply 4*l.* 10*s.* 8*d.* the middle Number, and the Product is the Answer, *viz.* 13*l.* 12*s.* 0*d.* as before. But if the Question had been stated contrariwise, *viz.* If 24 Yards cost 13*l.* 12*s.* what 8 Yards? Then you might have done it by the other short Way, as follows.

Yards. l. s. Yards.
If 24 cost 13 12, what 8?

$$\begin{array}{r} 8 \\ \hline 8 \overline{) 108} \quad 16 \\ \hline 3 \overline{) 13} \quad 12 \\ \hline \text{Ans. } l. \quad 4 \quad 10 \quad 8 \end{array}$$

3) Or thus:
l. 108 16

$$8 \overline{) 36} \quad 05 \quad \frac{1}{4}$$

As before l. 4 10 8

Or divide the first Number (when that is greatest) by the 3d, and by that Quotient divide the 2d, and that last Quotient is the Answer, as under.

Yards. l. s. Yards.
If 24 --- cost 13 12 --- what 8?

$$\begin{array}{r} 3 \\ \hline 3 \overline{) 4} \quad 10 \quad 8 \text{ Answer.} \end{array}$$

When any thing remains (in the second short Method) after you have divided the third Number by the first, then the first and third Numbers are not proportional; for if they be, there will remain nothing. In this Case, I say, when any thing remains, you must, after you have multiplied the middle Number by the Quotient or whole Number; then multiply also the middle Number by the *Numerator* of the Fraction in its lowest Terms, and divide that Product by the *Denominator*, and add that Quotient to the former Product of the second Number multiplied by the Quotient, or whole Number aforesaid. An *Example* or two, will make it easy to be understood.

But before I proceed, 'twill be necessary a little to explain the Meaning of the *Numerator* and *Denominator* of a Fraction, and how to reduce it into its lowest Terms.

A Fraction, or Part of a whole Number, arises from *Division*; and what remains after the *Division* is ended, is the *Numerator*, and the *Divisor* is the *Denominator*. As suppose your Divisor is 12, and your Remainder 4, then 4 is the *Numerator*, and 12 the *Denominator*; and if set *Fraction-wise*, stand as follows:

Re-

And
lowest
Denom
any of
for the
der, n
both N
as leav
do so,

Red
lowest

He
it, say
Then
which
duced
it by
once,
ed at
in Va
4 of

Remainder 4 Numerator.

Divisor 12 Denominator.

And to reduce this (or any other Fraction) into its lowest Terms, halve the Numerator, and also the Denominator; or divide them by 3, 4, 5, &c. or by any of the 9 Digits; that nothing remain in either; for that Figure which divides one without a Remainder, may not do so by another, but you must divide both Numerator and Denominator by such a Number as leaves no Remainder in either. But if you cannot do so, then is the Fraction in its lowest Terms already.

Example.

Reduce the afore-mentioned Fraction $\frac{4}{12}$ into its lowest Terms.

$$\frac{1}{2} \left\{ \frac{4}{12} \right\} = \frac{2}{6} \left\{ \frac{1}{3} \right\} \text{Lowest Terms.}$$

$$\frac{1}{3} \left\{ \frac{4}{12} \right\} = \frac{1}{3} \text{Lowest Terms.}$$

Here I reduce it, by dividing it by 2, or halving it, saying the half of 4 is 2, and the half of 12 is 6: Then again the half of 2 is 1, and the half of 6 is 3; which is as far as I can go, and the Fraction is reduced into its lowest Terms, viz. $\frac{1}{3}$. But if I divide it by 4, it reduces it sooner; for I say the 4's in 4 once, and the 4's in 12, 3 times: And so it is reduced at once into $\frac{1}{3}$, as *per* Work. And this $\frac{1}{3}$ is equal in Value with $\frac{4}{12}$, for as 1 is the 3d Part of 3, so is 4 of 12.

Example

Example. 15.

If in 15 Weeks I spend 5*l.* 5*s* what is that a Year?

The common Way.

Short Way.

W. l. s. W.
If 15—5 5—52?

W. l. s. W.
If 15—5 5—52)3 $\frac{7}{15}$

$$\begin{array}{r}
 20 \\
 \hline
 105 \\
 52 \\
 \hline
 210 \\
 525 \\
 \hline
 210 \\
 15)5460(3614 \\
 45 \dots \\
 \hline
 96 \\
 90 \\
 \hline
 60 \\
 60 \\
 \hline
 (0)
 \end{array}$$

$$\begin{array}{r}
 3 \\
 \hline
 15 \quad 15 \\
 2 \quad 9 \\
 \hline
 \text{Answ. } l. 18 \quad 4 \left\{ \begin{array}{l} 3)36 \quad 15 \\ 5)12 \quad 05 \\ \hline 2 \quad 09 \end{array} \right.
 \end{array}$$

Here I divide 52 the 3d Number, by 15 the first Number, and it quotes 3, and the Remainder is 7, by which 7, after I have multiplied by 3, I multiply by *l.* 5-5, the middle Number, and the Product is 36-15, which I divide by 15, the first Number, at twice, and the last Quotient is *l.* 2-9, which is $\frac{7}{15}$, Seven Fifteenths of *l.* 5-5, which is added to the *l.* 15-15, the Product of *l.* 5-5, multiplied by the Quotient 3, and they make *l.* 18-4, as by the common Way. See the Work.

Example 16.

If 45*l.* buy 15C. $\frac{3}{4}$ 12lb. of Mather, what will 200*l.* buy at that Rate?

Common

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Common Way.

l. C. grs. lb. l.
If 45--15 3 12--200

Ans. 70 1 25

Short Way.

l. C. grs. lb. l.
If 45--15 3 12 200(4
4 180

C. grs. lb.
The $\frac{4}{9}$ of 15 3 12

63 1 20 } (20
7 0 05 } 5 $\frac{4}{9}$
45
70 1 25 Answer.

C. grs. lb.

45)355:00(7893(70 1 25 Answer

Here I divide the third Number 200, by 45, the first Number, and it quotes 4. by which I multiply the middle Number C. 15 3 12, and the Product is C. 63-1-20. But there is a Remainder of $\frac{20}{45}$, which, in its lowest Terms, is 4 Nincths ; wherefore I take the $\frac{4}{9}$ of the middle Number, that is, by multiplying by 4, and dividing by 9, according to Rule, and there is produced C. 7-0 5 more, to be added to C. 63-1-20, and the Total is C. 70-1 25.

Example. 17.

If 26 Yards of Broad Cloth cost *l.* 12-2-8, what will 248 Yards cost at that Rate?

Yds. l. s. d. Yds.
26—12 2 8—248?

20

242

12

2912 *Ayre's Arith.*

248 *page 105.*

23296

11648

5824

— 12)

26)722176(27776 Pence] *l.* 115-14-8 Answer.

Shorter

Shorter Way.

$$\begin{array}{r}
 \text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9) \\
 \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} 9 \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} 234 \\
 \hline
 \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} 109 \quad 04 \quad 0 \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} 14/7. \\
 \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} 7 \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} 6 \quad 10 \quad 8 \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} \\
 \hline
 \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} 26/13 \\
 \hline
 \text{L. } 115 \quad 14 \quad 8 \text{ Answer} \text{ ---} \\
 \hline
 13)84 \quad 18 \quad 8 \\
 \hline
 \text{To be added } 6 \quad 10 \quad 8 \\
 \hline
 \hline
 \end{array}$$

Example 18.

If 27 Acres of Land let for 17*l.* 10*s.* what will
 35 Acres come to at that Rate?

<i>Acres</i>	<i>l.</i>	<i>s.</i>	<i>Acres.</i>
If 27 ---	17	10	135
	20		

Shorter Way.

$$\begin{array}{r}
 350 \quad \text{If } 27 \text{ --- } 17 \quad 10 \text{ --- } 135(5) \\
 135 \phantom{\text{If } 27 \text{ --- } 17 \quad 10 \text{ --- } 135(5)} 5 \quad 135 \\
 \hline
 1750 \quad \text{Answ. } \text{L. } 87 \quad 10 \quad (0) \\
 1050 \\
 350 \\
 \hline
 \phantom{1750 \quad \text{Answ. } \text{L. } 87 \quad 10 \quad (0)} \phantom{1750 \quad \text{Answ. } \text{L. } 87 \quad 10 \quad (0)} 2/0) \\
 27)47250(175/0 \\
 27 \dots \text{ ---} \\
 \hline
 \text{L. } 87 \quad 10 \\
 202 \text{ ---} \\
 189 \\
 \hline
 135 \\
 135 \\
 \hline
 (0)
 \end{array}$$

Thus

Thus by one of these short Ways, may most Questions in this Rule be answered, and much Time, and many Figures saved. I shall now only add some Questions with their Answers, for the Learner's Practice.

19. If 18 Yards $\frac{3}{4}$ of Serge cost 2l. 5s. how many Yards of the same may I have for 300 Guineas at 21s. 6d. each? Answer 2687 $\frac{1}{2}$ Yards.

20. If 37 Acres of Land let for l. 13-11-4 what is that an Acre? Answer 7s. 4d. per Acre.

21. If I have an Estate of 470l. *per Annum*, what may I expend daily, and yet lay up yearly 130l.

Answer 18s. 7d. $\frac{1}{2}$ $\frac{90}{105}$.

22. How many Dozen of Stockings, at 11 Groats per Pair, may I buy for l. 190-12? Ans. 86 Doz. 7 Pr $\frac{28}{11}$.

23. Bought 6 Chests of Sugar, each 6C. $\frac{1}{4}$, at 56s. per C. what come they to? Answer l. 113-8.

24. Sold a Piece of Cloth, *qt.* 29 $\frac{1}{2}$ Yards, for l. 5-17, what is that *per Ell English*? Answer 4s. 11d. $\frac{1}{4}$ $\frac{11}{18}$.

25. *A* owes *B* l. 296-17, but he compounds for 7s. 6d. in the Pound, what must *B* receive for his Debt?

Answer l. 111-6-4 $\frac{1}{2}$.

26. If the Interest of 100 l. for a Year comes to 6l. what is the Interest of l. 315-12 6, for the same time? Answer l. 18-18 9

27. Bought a Cask of Wine, for l. 62-8, how many Gallons were in the same, when the Gallon was valued at 5s. 4d? Answer 234 Gallons,

28. What comes the Commission to, of l. 490 12. at l. 2 $\frac{1}{2}$ *per Cent*? Answer l. 12-5-3 $\frac{1}{2}$.

29. If the whole of a Ship cost l. 1270-10, what doth $\frac{3}{5}$ Parts come to at that Rate? Ans. l. 119-2-2 $\frac{1}{2}$.

30. If *A* owes *B* l. 395-18, but compounds the whole Debt for l. 100 12, what is that in the Pound?

Answer 5s. 1d. almost, or 5s. 0 $\frac{1}{4}$, $\frac{7445}{7918}$.

31. What comes C. 19 2 qrs. 12lb. of Sugar to, at 5d. $\frac{1}{2}$ per Pound? Answer l. 50-6-6.

32. Arrived from *Turkey* 246 Bales of *Tripoly* *Beladine* Raw Silk, weighing one with another, C. 2 $\frac{1}{2}$, at 5s. 6d. the Pound, of 24 Ounces, what do they amount to? Ans. 146723-12s.

33. If I have l. 214 a Year, what is that for 19 Weeks? Answer l. 78-3-10⁸/₇₂

34. What comes the Insurance of l. 642-12 6 to, at 4 Guineas *per Cent.* the Guinea at 21s. 6d.

Answer l. 27-12-7¹/₂

35. If I Buy 100 Yards of Ribbon, at 3 Yards for a Shilling, and 100 of *ditto* at 2 Yards for a Shilling, and sell it again for 2 Shillings the 5 Yards, the Question is, *Whether I get or lose, and how much?*

Answer I lose 3s. 4d

36. Shipt for *Jamaica*, 550 Pairs of Silk Stockings at 11s. 6d *per* Pair, and 460 Yards of stuff, at 14d. *per* Yard; in return of which I have had C. 46¹/₂ of *Sugars.* at s. 24-6 *per* C. and 1570lb of *Indigo*, at s. 2-4 *per* lb. what remains due to me of my Adventure?

Answer l. 102-12-11¹/₂

Exported,	343	01	8
Imported,	240	08	8 ¹ / ₂

Difference,	102	12	11 ¹ / ₂
-------------	-----	----	--------------------------------

37. How long will 1000l last me, if I spend no more or less than 3s. 6d *per* Day? Ans. 15 Years, 7 Months, accounting 30 Days to the Month and 29 Days ¹/₂, ²/₃.

38. Shipt for the *Streights* 100 Pigs of Lead, *qt.* C. 283 ³/₄ 12lb at l. 10 17 *per* Fodder, of C. 19¹/₂, what come they to? Answer l. 157-18-9¹⁸⁶⁰/₁₁₈₃

To Rate Town-Taxes.

39 Suppose A hath an Estate of 53l. a Year and payeth s. 5-10 to the Subsidy, what shall B pay whose Estate is worth 100l. *per Annum?* Answer 11s ⁴/₇.

40. Admit a Tax or Rate of 39 l. is laid on a Town for the Bulding of a Bridge; and the Value of the *Town-Rent* is 900l. *per Annum*, what is each Man's Proportion to pay, according to his Rent? If one Man in the Town be worth 100l. a Year, what shall he pay to the said Rate, or 39l? Answer l. 4-6-8

Profit

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Profit and Loss.

41. If I buy a Tun of Wine at 9*l.* per Hogshead, and sell it again at 13*l.* per Hhd. what do I gain *per Cent.*?

Ans*w.* *l.* 44 8 10 $\frac{1}{2}$ or $\frac{1}{3}$.

Company.

42. Two Partners join Stocks for a certain Time. *A.* puts in 250*l.* *B.* 430*l.* and in Trade they have gained 340*l.* what must each Man have of the Profit, in Proportion to his Money in Company?

l. 250 *A.*

430 *B.*

If *l.* 680 — *l.* 340 — *l.* 250 — Ans. *l.* 125

If 680 — 340 — 430 — 215

Proof, 340

Barter.

43. How many Dozen of Candles, at 5*s.* 2*d.* per doz. must I give for *C.* 3 $\frac{1}{2}$ of Tallow, at 37*s.* 6*d.* per *C.*?

Ans. 25 Doz. $\frac{1}{8}$ $\frac{1}{2}$.

Whereas a Noble and a Mark, just 15 Yards did buy, How many Ells of the same Cloth for 50 Pounds had I?

Ans. 600 Ells.

If 15 Pounds cost 16 Pence, of Bread that's made of Rye,
How many Loaves, of 6 Pounds each, for Fourescore Pounds had I?

Ans*w.* 3000.

£

If

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*If 5 Tuns of Logwood cost 56 Pounds,
How many full Hundreds for 96 Crowns?*

Ans. 42C. 3qrs. 12 or 24lb.

*If 15 Hundred of our Lead cost 16 Pounds in Gold,
How much of that Saturnian Ore for 40 Pounds is sold?*

Ans. 37C. $\frac{1}{2}$.

*If 30 Pence, and 40 Groats, buy 50 Pints of Wine,
What is the cost of 60 Quarts in current English Coin?*

Answer 38 Shillings.

*If 9 Pounds of our English Wool, doth 90 Pence require,
The Value of 1C. Weight of you I do desire.*

Ans. 4l. 13s. 4d.

*If the Half of a Mark buy the fourth of a Pound,
How much Cochineal can I have for a Crown?*

Ans. 3 Ounces.

*If 16 Shillings and a Crown, for 13 Weeks supply
For meat and Drink, that is my Board; how much a
Day give I?*

Ans. 2d $\frac{1}{2}$ per Day.

*If that a Rule of 3 Feet long doth give 5 Feet in Shade,
And if a Steeple 99, how high in Feet is't made?*

Ans. 59 Feet $\frac{2}{3}$.

To prove the Rule of Three Direct.

Multiply the fourth Number, or Answer to the Question, by the first; then multiply the second and third Numbers together, and if the Products be alike, the Work is right.

For Trial of which, let us prove the first Question in this Rule which was,

If 12 Ells cost 36s. what 456 Ells?

And

Chap. 8. *The RULE of THREE.* 107

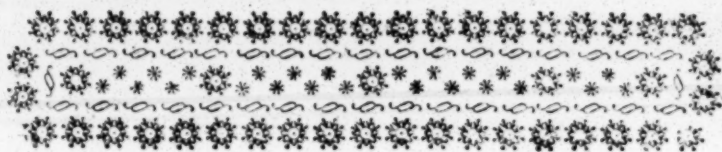
And the Answer there found, or fourth Number, was 1368 Shillings; which multiplied by the first Number, 12, produces 16416, then multiply also the second and third Numbers together; to wit, 36, and 456; and the Product is also 16416, wherefore the Answer is right.

But observe well, that when there is any Remainder, after you have divided the Product of the second and third Numbers by the first, such Remainder must, in the Proof, be added to the Product of the first and fourth Numbers, which must be equal to the Product of the third Number multiplied by the second.

Or, the Numbers may be more intelligibly proved by varying the Question, thus:

If 456 Ells cost $\text{£} 68 : 8$, what 12 Ells? *Ans.* 36s.

As in the second *Example* of this Rule.



C H A P IX.

The Rule of Three Inverse.

I. **I**N this Rule, the 4th Number sought, bears the same Proportion to the first, as the second does to the third Number.

II. The Stating of the Question in this Rule differs not from the Method of Stating in the *Direct Rule*; for the Number that asketh the Question, must be the third Number here, as well as there, &c. And to know when the Question belongs to this *Rule*, and when to the *Direct*, observe this General Rule.

When the Question is stated, consider whether the 4th Number, or Answer, ought to be more or less than the second Number (which is easily known;) if more, the

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least of the two Extrems must be your Divisor; but if it ought to be less, then the biggest of the two Extrems must be your Divisor. [*Here the first and third Numbers are called Extrems, with respect to the second.*] If the first Number is the Divisor, then the Question belongs to the *Direct Rule*; but if the third is the Divisor then the Question pertains to the *Rule of Three Inverse*.

III. In this Rule you must multiply the first and second Numbers together, and divide that Product by the third and the Quotient is the Answer, in the same Name with the middle Number.

In this Rule *Note also*, That when the third Number is less than the first, then the Answer required will be greater than the second.

Or, when the third Number is greater than the first, the Answer will be less than the second.

Example. 1

If 6 Mowers can mow a common Field in 12 Days, in what time will 24 Mowers do it? Answer in 3 Days.
Thus stated.

If 6 ——— require 12 ——— what 24?
6 First Number.

Third Number 24) 72 (3 Days, the Answer.

72

—

(0)

Here I consider the fourth Number, or Number sought, requires less than the second; for the more the Hands, the lesser the time, and therefore the greater of the two Extrems must be the Divisor, which is the third Number, therefore the Question is to be answer'd by the *Rule Inverse*. Wherefore, according to *Rule the 3d*, I multiply the first and second Numbers together and divide by the third, and the Quotient is the Answer, *viz.* 3 Days; as in the preceding Work.

Here,

Chap. 9. *The RULE of THREE Inverse.* 199

Here, as the third Number contains the second twice
so doth the fourth contain the first, according to the first
Rule of this Chapter

Example 2.

If when Wheat is 4s. the Bushel, the 20 Penny-Loaf
weighs 18lb. what must the said 20 Penny loaf weigh
when wheat is 6s. the Bushel? Answer 12lb.

If 4 give 18, what 6?

$$\begin{array}{r} 4 \\ \hline 6)72(12\text{lb. Answer} \end{array}$$

Here also the 4th Number requires less; for the dearer
the Wheat, the lesser or lighter the Loaf: So therefore,
the greater of the two Extrems *viz.* 6, is the Divisor,
which being the third Number, denominates the Question
to be *Inverse*.

Example 3.

Admit I lend a Friend on his occasion, 100l. for 6
Months, and he promises me the like Kindness when I
desire it; but when I came to request it, he could lend
me but 75l. the Question is, how long I may keep his
Money to recompence my Courtesy to him?

Answer Eight Months.

If 100 give 6, what 75?

$$\begin{array}{r} 6 \\ \hline 75)600(8 \text{ Months, Answer.} \\ 600 \\ \hline (0) \end{array}$$

Here it is apparent, the lesser the Sum, the more the
Time and therefore the lesser Extream is the Divisor
which is 75

Example 4.

How many Dollars at 4s. 4d. must be given for 360
Guilfers, at 2s. 2d. Answ. 180.

s. d.		s. d.
If 2 2 give 360, what 4 4?		
12	26	12
26	2160	52
	720	

52)9360(180 Dollars.

52..

416

416

(0)

Here the more the Value, the fewer the Pieces, and
therefore the bigger of the Extrems is the Divisor,
which is the 3d Number, and therefore it is *Inverse*.

Example 5.

If 100/. Principal gain 5l. Interest in 12 Months,
what Principal will gain as much in 5 Months?

Answ. 240/.

M.	l.	M.
12	100	5
	12	

5)1200

l. 240 Principal. Answer.

If 45 Acres be moved by 6 Men, how much sooner.
will they be mowed by 10.

The 6 Men in 3 Days suppos'd are to do't,

The Time must be less, 'cause more are put to't.

Answ. 1 Day, $\frac{3}{10}$.

Example

Example 6.

When an Acre of Land doth contain 4 Poles in Breadth, then must it *qt.* 40 in Length; what must be the Length, when there is 13 Poles in Breadth? *Answ.* 12 P $\frac{4}{11}$ or 5 Foot, $\frac{1}{11}$. See the Work.

P. B. P. L. P. B.

If 4 give 40, what 13?

$$\begin{array}{r}
 4 \\
 \hline
 13 \overline{)160} (12 \\
 \underline{13} \\
 30 \\
 \underline{26} \\
 4 \\
 16\frac{1}{11} \\
 \hline
 64 \\
 2 \text{ the } \frac{1}{11} \text{ of } 4. \\
 \hline
 13 \overline{)66} (5 \text{ Foot } \frac{1}{11} \\
 \underline{65} \\
 (1)
 \end{array}$$

Here the Breadth is more, and therefore the Length must be less.

Example 7. A Room 30 Foot long, and 18 Foot wide, is to be covered with painted Cloth, how many Yards of *Holland Duck*, of $\frac{3}{4}$ Wide, will cover it?

Answer 240 Foot or 80 Yards.

Ex. 8 If a Man performs a Journey in 6 Days, when the Day is 8 Hours long, in what Time will he do it when the Day is 12 Hours long? *Answ.* 4 Days.

K 4

Ex.

Ex. 9. If 150 Pioneers cast a Trench in 24 Hours, how many must be set on to perform it in 6 Hours?

Answ. 600 Pioneers.

Ex. 10. If a Piece of Grass will graze 56 Oxen 6 Days, how many must be turned out, that it may last the remaining Oxen 16 Days? Answ. 35 Oxen out, 21 stay.

Ex. 11. How much Shalloon, of 37rs. wide will serve to line 9 Yards of Cloth of 79rs. wide? Answ. 21 Yds.

Ex. 12. If 10 Pounds worth of Wine, at 18d. the Bottle, accommodate 30 Men, how many will the said ten Pounds entertain with Wine, at at 3s. 6d. the Bottle?

Answ. $12\frac{1}{2}$ Persons.

Ex. 13. If for 5l. 5s. I have 14C. Wt. carried 136 Miles, how many Miles may I have 24C. carried for the same Money? Answ. $79\frac{1}{2}$ Miles.

Ex. 14. In 730 German Rix-Dollars, at 4. 5d. $\frac{3}{4}$, how many Venetian Ducats at 4s. 4d. Answ. 754, $\frac{118}{1000}$.

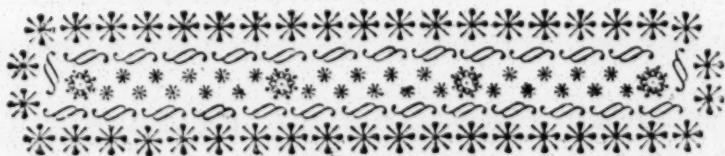
Ex. 15. How many Pounds of Coffee, at 5s. 9d. per lb. is equal in Value to 426 Pound of Tea, at 13s. 4d. per lb. Answ. $987\frac{1}{8}$.

Ex. 16. If 60 Ells *English* be equal to 100 Ells *Flemish*, and each Ell *English*, contains 20 Nails of a Yard, how many such Nails doth the *Flemish* Ell contain?

Answ. 12 Nails.

Ex. 17. If 14 Men, in 15 Days, build 16 Rod of Wall, How many Men must added be to do't in 2, that's all?

Answ. 105 Men.



C H A P. X.

The Double Rule of Three Direct.

I. **Q**UESTIONS in this Rule have five given Numbers, to find a sixth in Proportion.

II.

II. Any Question in the *Double Rule of Three* may be answered by two *Single Rules of Three*; that is, at two Statings, &c or by one Rule composed of the five given Numbers.

III. Three of the five given Numbers imply a Supposition, and the other two a Demand.

Example 1.

If 100*l* in 12 Months gain 6*l* Interest, what will 25*l*. gain in 4 Months?

Here the Supposition lies on the first Numbers, *viz.* 100, 12, and 6; for it is said, If (or suppose) 100*l*. in 12 Months, gain 6*l*. Interest; and the Demand lies on the two last Numbers, *viz.* 25 and 4; for it is Demanded what will 25*l*. gain in 4 Months?

IV. In your first stating, you must observe always to make that the second Number, which is of the same Denomination with the Number required; and one of the other Numbers in the Supposition (it matters not which) must be the first Number; and that Number in the Demand of the same Name with the first, must be the third Number; and then your first stating will stand thus:

1. Prin.	1. Int.	1. Principal.
If 100—	gain—6,	— what 25?

Here the 2d Number is of the same Name with the Number required; for the Interest of 25*l*. is required; and the second Number is Pounds Interest; and the first Number is Pounds Principal; and so is the third Number, 25, being one of the Numbers in the Demand. And being so stated, I work as in the *Single Rule of Three*, thus:

$\begin{array}{ccc} \text{I. P.} & & \text{I. I.} & & \text{I. P.} \\ \text{If } 100 & \text{--- gain } 6, & \text{--- what } 25? & & \end{array}$

$$\begin{array}{r} 6 \\ \hline 1.1 \overline{) 50} \\ 20 \\ \hline \end{array}$$

10/00 Answ. 1/ 10s.

Here I cut off two Figures towards the right Hand, which is divided by 100, according to to the Directions given in *Division*.

And now having found the Interest of 25*l.* by this first Operation, I proceed to the second: And note always, *That the Answer to the first Stating is the middle Number to the second*; as thus:

$\begin{array}{ccc} \text{Mo.} & & \text{s.} & & \text{Mo.} \\ \text{If } 12 & \text{--- give ---} & 30, & \text{--- what } 4? & \\ & & 4 & & \\ & & \hline & & 12 \overline{) 120} & & \\ & & \hline & & 10s. \text{ Answer.} & & \end{array}$

Here in the second Stating, the remaining Number in the Supposition is the first; and the other of the same Name in the Demand, is the third Number, and the middle Number is of the same Name we seek for; *viz.* Interest; and is the Answer to the Question, *viz.* 10*s.*

And thus, by these two Operations in the *Rule of Three* I find the Answer to the Question, *viz.* That if 100*l.* Principal in 12 Months, gain 6*l.* Interest, the 25*l.* Principal will gain 10 Shillings Interest in 4 Months.

The same Answer will also be found, if you work after the following Manner:

If 12 gain 6, what 4?

$$\begin{array}{r} 4 \\ \hline 12 \overline{) 24} \\ \hline 2 \text{ l. Answ.} \end{array}$$

If 100l. gain 2l. what — 25l.

$$\begin{array}{r} 20 \quad \text{s. 40 2d. Numb.} \\ \hline 40 \quad 10 \overline{) 100} \text{ Answ. 10s.} \\ \hline 1 \overline{) 100} \end{array}$$

The middle Number in the last Stating is brought into Shillings, otherwise I could not have divided by the first Number.

V. The last Question, or any other in this Rule, may be also answered by a Rule composed of the five given Numbers (as was said in the II^d. Rule of this Chapter) after this Manner: State the Question so, that the Numbers may stand in one continued Rank, and in such Order, that the first and fourth Numbers may be of one Denomination, and the second and fifth.

Then multiply the two first Numbers together, for a Divisor; and the three last together for a Dividend, and the Quotient will be the Answer, in the same Name with the middle or third Number, for the Trial of which, let us take the last Example, viz.

K 6

If

If

(1) (2) (3) (4) (5)
l. P. M. l. l. l. P. M.
 If 100 in 12, gain 6, what 25 in 4?

$$\begin{array}{r}
 12 \\
 \hline
 1200 \\
 \\
 20 \\
 \hline
 120 \\
 25 \text{ 4th Number.} \\
 \hline
 600 \\
 240 \\
 \hline
 3000 \\
 4 \text{ 5th Number.} \\
 \hline
 \end{array}$$

Divisor 12/00)120/00
 10 Shillings, Answer.

Here the Question is stated, and worked as before directed; and the Answer is 10*s.* as it was when wrought at two Operations.

If the foregoing Directions are heedfully attended to, they are sufficient for any one's Instruction in the *Double Rule of Three Direct*; and also for the working of any Question therein, by the Rule composed of 5 Numbers, and therefore I shall only add some Questions, with their Answers, and so proceed to the next Rule.

Example 2. If 750 Bushels of Oats serve 500 Horses 6 Days, how many Bushels will serve 1000 Horses 14 Days? Answ. 3500 Bushels.

Ex. 3. If 36 Acres of Grass be mowed by 6 Men in 8 Days, how many Acres will be mowed by 36 Men in 38 Days? Answ. 1026 Acres.

Ex. 4. If 1000*lb.* of Beef or Pork, serve 250 Seamen 7 Days, how many Pounds of ditto will serve 550 Seamen 63 Days or 9 Weeks? Answ. 19800*lb.*

Ex. 5. If a Carrier receives 30*s.* for the Carriage of 3*C.* Weight 150 Miles, what must he receive for the Carriage of 7*C.* Weight 50 Miles? Answ. 23*s.* 4*d.*
Ex.

Ex. 6. If 100*l.* in 12 Months gain 5*l.* Interest, what will 63*l.* gain in 6 Months at that Rate?

Answer *l.* 1-11 6.

Ex. 7. If 6 Quarters of Malt are sufficient for a Family of 12 Persons, for 3 Months, how many Quarters will serve a Family of 24 Persons 12 Months?

Answer 48 Quarters.

Ex. 8. If a Person takes in 320*l.* to pay Interest for the same. and at the End of 12 Months pays for Principal and Interest *l.* 339-4; the Question is. at what Rate *per Cent. per Annum* did he pay Interest?

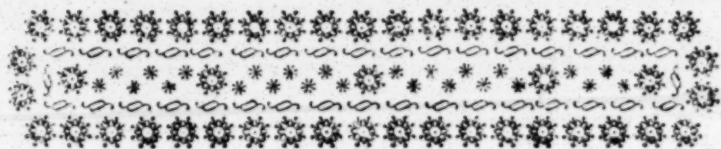
Answer 6 *per Cent. per Annum.*

Ex. 9. If 15*s.* pay 5 Men for 6 Days, how much will pay 20 Men for 10 Days?

Answer. 5*l.*

Ex. 10. If 36 Bushels of Wheat in one Year yield 216 Bushels, how much will 36 Quarters yield in 6 Years?

Answer 10368 Bushels.



CHAP. XI.

The Double Rule of Three Inverse.

QUESTIONS in this Rule are wrought by two single *Rules of Three*, as those in the foregoing Rule; but you are to observe, that one of the Statings (and never but one) will fall out to be *Inverse*, and must be worked accordingly.

Any Question in this Rule also may be answered by the Compound Rule of five Numbers; observing to make the second and fourth Numbers of the like Name, and the third and fifth; then multiply the third and fourth Numbers together for a Divisor, and the other three remaining Numbers together for a Dividend, and the Quotient will be the Answer in the same Name with the first Number.

Ex.

Example 1.

If 50 Pioneers in 6 Days cast a Trench 30 Yards long, how many Pioneers will cast a Trench 200 Yards long in 3 Days? Answ. $666\frac{2}{3}$ Pioneers.

D. Pion. D. Yds. Pion. Yds.
If 6 require 50 what 3? If 30 require 100, what 200?

$$\begin{array}{r} 6 \\ \hline 3 \overline{)300} \\ \hline 100 \end{array}$$

$$\begin{array}{r} 100 \\ \hline 3 \overline{)2000}0 \\ \hline 666\frac{2}{3} \end{array}$$

If 30 require 50, what 200? If 6 require $333\frac{1}{3}$, what 3?

$$\begin{array}{r} 50 \\ \hline 3 \overline{)1000}0 \\ \hline \text{Answ. } 333\frac{1}{3} \end{array}$$

$$\begin{array}{r} 6 \\ \hline 3 \overline{)2000} \\ \hline 666\frac{2}{3} \end{array}$$

Here the Question is answered by two single *Rules of Three*, two different Ways, as in the foregoing Work may be seen; and the first stating in the first Way falls out to be *Inverse*, but the last in the second Way does the same; for both statings are never *Inverse*, as was said before.

Or it may be done by the Compound Rule of five Numbers, thus:

$$\begin{array}{cccccc} (1) & (2) & (3) & (4) & (5) \\ P. & D. & Yds. & D. & Yds. \\ \text{If } 50 & \text{---} 6 & \text{---} 30 & \text{---} 3 & \text{---} 200 \\ & & 3 & & 6 \text{ Second,} \end{array}$$

$$\begin{array}{r} 90 \\ \hline 1200 \\ 50 \text{ First,} \end{array}$$

$$9 \overline{)6000}0$$

Anf. $666\frac{2}{3}$, or $\frac{2}{3}$.

Example

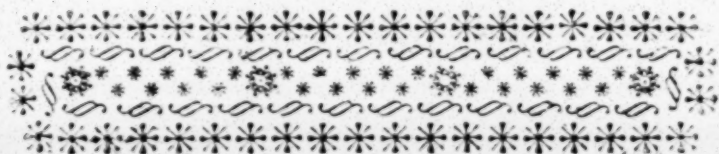
Example 2. If 100*l.* Principal in 12 Months gain 6*l.* Interest, what Principal will gain 18*l.* in 15 Months?

Ans. 240*l.*

Example 3. If a Person travels 320 Miles in 10 Days, when the Day is 12 Hours long, in how many Days may he travel 600 Miles, when the Day is 16 Hours long?

Ans. 15 Days.

Example 4. If 36*l.* serve for the Board of 12 Persons 6 Weeks, how long, or how many Weeks will 260*l.* serve for the Board of 36 Persons? Ans. $14\frac{2}{3}$ Weeks.



CHAP. XII.

Rules of PRACTICE.

THESE Rules are most compendiously contrived for the speeding casting up of any Sort of Goods, or Merchandize: and therefore are of Excellent Use among *Merchants, Tradesmen, &c.* for their quick and elegant Dispatch of Business; and, from their frequent Use, are called Rules of *Practice*.

Any Question in the *Rule of Three*, that hath an Unit, or 1 for its Number, may be much sooner done by these brief Rules, than the Method followed in that, is too much abounding in Figures.

In order for working, the following Tables are to be well understood, and perfectly got by Heart.

To be

The Even Parts of MONEY.

<i>Parts of a Shill.</i>			<i>Of a Pound,</i>	<i>Parts of a Pound,</i>				
<i>d.</i>				<i>s. d.</i>				
$\left\{ \begin{array}{c} 6 \\ 4 \\ 3 \\ 2 \\ 1\frac{1}{2} \\ 1 \end{array} \right\}$	is	$\left\{ \begin{array}{c} \frac{1}{2} \\ \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{6} \\ \frac{1}{8} \\ \frac{1}{12} \end{array} \right\}$	or	$\left\{ \begin{array}{c} \frac{1}{20} \\ \frac{1}{40} \\ \frac{1}{60} \\ \frac{1}{80} \\ \frac{1}{100} \\ \frac{1}{120} \\ \frac{1}{160} \\ \frac{1}{200} \end{array} \right\}$		$\left\{ \begin{array}{c} 10\ 0 \\ 6\ 8 \\ 5\ 0 \\ 4\ 0 \\ 3\ 4 \\ 2\ 6 \\ 2\ 0 \\ 1\ 8 \\ 1\ 0 \end{array} \right\}$	is	$\left\{ \begin{array}{c} \frac{1}{2} \\ \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{5} \\ \frac{1}{6} \\ \frac{1}{8} \\ \frac{1}{10} \\ \frac{1}{12} \\ \frac{1}{20} \end{array} \right\}$
3 Farthing								
1 Halfpenny								
1 Farthing								

The Even Parts of WEIGHT.

<i>Pts. of a Tun.</i>		<i>Pts. of C. Weight.</i>		<i>Pts. of $\frac{1}{2}$ C. and $\frac{1}{4}$ C.</i>			
<i>C.</i>							
10	} is,	$\frac{1}{2}$	2 qrs.	} is,	$\frac{1}{2}$	} $\frac{1}{2}$ C.	
5		$\frac{1}{4}$	1 qr.		$\frac{1}{4}$		28
4		$\frac{1}{5}$	0 16th.		$\frac{1}{7}$		14
2 $\frac{1}{2}$		$\frac{1}{8}$	0 14		$\frac{1}{8}$		8
2		$\frac{1}{10}$	0 8		$\frac{1}{14}$		7
1 $\frac{1}{4}$		$\frac{1}{12}$	0 7		$\frac{1}{16}$		14
1		$\frac{1}{16}$					7
				4			

I. When the Price of the Integer is a Farthing, take the 4th Part of the given Number (or divide it by 4) and the Quotient is Pence, and if any thing remain, it is Farthings; then those Pence divide by 12 and by 20; or you may take the 6th Part of the given Number, and the Quotient will be three Halfpences, and them divide by 8 and by 20. Or else you may take the 12th Part, and the Quotient will be Threepences. *Examples of these several Ways follow, viz.*

4)987654

4)987654 lb. of Cast Iron, at $\frac{1}{4}$ per lb.

12)246913— $\frac{1}{2}$ Rem. because the Dividend was
[Farthings.

2)0)2057|6—1d.

Ans. $\therefore$ 1028-16-1 $\frac{1}{2}$, Answer.

Again.

6)987654

1)164609 Three Halfpences.

2)0)2057|6—1d. $\frac{1}{2}$ Because the Dividend was Three-
[Half-pence.

Ans. $\therefore$ 1028-16-1 $\frac{1}{2}$ Answer.

Once more.

12)987654

Three-pences. $\frac{1}{4}$)82304—1 $\frac{1}{2}$

2)0)2057|6

Ans. $\therefore$ 1028-16-1 $\frac{1}{2}$

I have often observed, that Learners are many times in doubt concerning the several Remainders what to call, or account them; wherefore let them note once for all, That at any time, whatever remains, it is always of the same Name with that you account the Dividend; that is, if the Dividend is accounted Farthings, or Pence, or Shillings, &c. so is the Remainder to be reckoned. Or to represent it more intelligibly, the Remainder is always such a Part of a Shilling (if you take Parts of a Shilling)

as you take for, whether a $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, or $\frac{1}{32}$; that is, the Remainders are either Six-Pences, Groats, Three-Pences, &c. according to the Part you take. And so likewise for the even Parts of a Pound, you may be governed by the same Rules.

II. When the Price given is $\frac{1}{2}d.$ then take the 12th part of the given Number, and the Quotient will be Six-pences; of which take the Half, and they are Shillings, which divide by 20, by halving them, &c. to bring them into Pounds.

12) 5670lb. Copperas, at $\frac{1}{2}d.$ per lb.

d. 7 | 472 — 3d.

2 | 0) 23 | 6

l. 11-16-3 Answer.

lb. Or thus:

$\frac{1}{2}$) 5670 Sea Bread, at $\frac{1}{2}d.$

1d. 11 | 2835

2 | 0) 23 | 6 — 3d.

l. 11-16-3 Answer.

In the second Work I take the $\frac{1}{2}$ of the Half-pence, and they make Pence, of which I take the $\frac{1}{2}$ a Penny being the $\frac{1}{4}$ of a Shilling, &c.

III. When the Price is 3 Farthings, take the $\frac{1}{2}$ of the given Number of Integers, and that Half is 3 Half-pennies, or the 8th Part, and they are Six-pences; which either divide by 8, and by 20, or by $\frac{1}{2}$ and by 20, &c.

$\frac{1}{2}$ 4720 Ells of Canvas, at $\frac{3}{4}$

$\frac{1}{8}$ 2360

2 | 0) 29 | 5

l. 14-15 Answer.

Or thus:

$\frac{1}{8}$ 4720 Ells, at $\frac{3}{4}$

$\frac{1}{2}$ 590

29 | 5

l. 14-15 Answer.

that is,
Three.
And so
be go-

IV. When the given Price is Pence, and an even Part of a Shilling, consider what Part it is, and divide the given Quantity by it, and the Quotient is Shillings; and those Shillings by 20, &c.

17 1/2	549lb. Iron, at 1d.	3d 1/2	7654lb. Soap, at 3d.
	4)5-9d.		191)3-6.
	l.2-5-9 Answer.		l.95-13 6 Answer.
d			
1 1/8	369lb. at 1d 1/2.	4d 1/3	2486lb. at 4d.
	4)6-1 1/2		82)8-8
	l.2-6-1 1/2 Answer.		l.41-8-8 Answer.
2d 1/8	396Yds. Ribbon, at 2d 6d 1/2	1 1/2	5769 at 6d.
	36		288)4-6.
	l.3-6 Answer.		l.144-4-6 Answer.

pence,
Penny

of the
half-pen-
which
, &c.

at 3/4

Sums in *Practice* admit of various Ways of Working, and equally short, each producing the same Answer, and serve as a Proof of each other; and 'tis very proper, and most concise, to prove *Practice* by *Practice*. It likewise may be proved by the *Rule of Three*; or by reducing the Answer into the same Name with the Price, and divide it by the Price, and the Quotient will be the given Quantity; or if you divide by the Quantity, the Quotient will be the Price.

V. When the Price of the Integer is Pence, and no even Part of a Shilling, it may be divided into even Parts; as 7 Pence is composed of the Parts $\frac{1}{4}$ and $\frac{1}{2}$, viz. 3d. and 4d. Wherefore, first take $\frac{1}{4}$ of the given Number, and then the $\frac{1}{2}$ also, and add both Lines together. Likewise 9d. is composed of the Parts $\frac{1}{2}$ and $\frac{1}{4}$, or 6d. and 3d. and 5d. of 3d. and 2d. &c. Sometimes it is more concise

cise to take Part of Parts : Suppose $9d.$ were the Price, I first take $\frac{1}{2}$ for 6, and then the $\frac{1}{2}$ of that $\frac{1}{2}$ for the $3d.$ because $3d.$ is the $\frac{1}{2}$ of 6; and then I add the two Lines together. Or, if the Price were 5 Farthings, I take the $\frac{1}{2}$ for the Penny, and then the $\frac{1}{4}$ of that Line for the Farthing, because a Farthing is $\frac{1}{4}$ of a Penny.

Examples.

342lb. Candles, at $5d.$		489lb. Loaf-Sugar, at $9d.$	
$3d \frac{1}{4}$	85 6	$6d \frac{1}{2}$	214 6
$2d \frac{1}{6}$	57 0	$3d \frac{1}{2}$	107 3
	14 2 6		321 9
	l. 7 2 6 Answer.		l. 16 1 9 Answer.
679 Yds. Paving, at $7d.$		Or thus ; 429lb. at $9d.$	
$3d \frac{1}{4}$	169 9	$6d \frac{1}{2}$	214 6
$4d \frac{1}{3}$	226 4	$3d \frac{1}{2}$	107 3
	39 6 1		321 9
	l. 19 16 1 Answer.		l. 16 1 9 Answer.
l. 3790 Yds. Linnen, at $(10d.)$		Or thus : Yds. 37900	
$6d$	1895		12)315 8 4
$4d \frac{1}{3}$	1263 4		l. 157 18 4
	315 8 4		
	l. 157 18 4 Answer.		

In the last Work I put a Cypher to the given Number, which is multiplying by 10, and the Product is Pence; which I divide by 12 and by 20.

Chap. 12.
the Price,
or the 3d
two Lines
ke the 1st
r the Far

1349lb. Tobacco. at 11d.
6d 1/2 674—6d.
4 1/2 449 8
1 1/2 112—5
of 4d

123,6—7

l. 61-16—7 Answer

af-Sugar,
(9d)

Or thus :

1349lb. 11d.
10

13490

Odd Penny. 1349

12)14839

123|6—7

l. 61 16 7 Ans.

answer.

us ;
d.

4796 Quarts of Beer, at 5 grs.
1d 1/2 399—8
1/2 99—11
of a Penny. —
49|9—7

Ans. l. 24-19-7

answer,

VI. When the Price is Pence and Farthings, then work for the Pence as before; and for the Farthings, observe what Part they make, of the Parts taken before, which take out of any one of the Lines, of which the Farthings or Farthings make an even Part, and add all together.

856 Yds. Ribbon, (at 4d. 1/2)
1/3 285—4
1/8 35—8
of 4d. 32)1—0
l. 16-1-0

987 Yds. Painting [at 10d. 1/4]
6d 1/2 493—6
4 1/3 329
1/2 1/8 41---1 1/2
of 4d. 20---6 3/4
1/4 1/2 88,4---2 1/4

Number,
Pence;

l. 44 : 4 : 2 1/4 Ans.

Here,

Here I first take the $\frac{1}{3}$ Part of the given Number for the Groat; then for the Half-pence, I consider it is the 8th Part of 4d. wherefore I take the 8th Part of that Line, viz. 285s. 4d. saying the 8's in 28, &c.

479lb. Pepper, at		679lb. of Cotton, at	
(9d. $\frac{3}{4}$.		(7d. $\frac{1}{2}$.	
6d	$\frac{1}{2}$ 239—6	6	$\frac{1}{2}$ 339—6
$3\frac{1}{2}$ of 6	119—9	$1\frac{1}{2}$ of 6d	84—10 $\frac{1}{2}$
$\frac{3}{4}$ of 3d	29—11 $\frac{1}{4}$		42/4—4 $\frac{1}{2}$
	38/9—2 $\frac{1}{4}$		l. 21 : 4 : 4 $\frac{1}{2}$ Anf.
	l. 19-9-2 $\frac{1}{4}$ Anf.		

VII. When the Price is any Number of Pence above a Shilling, and not two Shillings, let the given Quantity stand as Shillings, and take even Parts for the Pence, and set the Quotient underneath in proper Order, without drawing a Line, and add it to the given Number, and the Total will be the Answer in Shillings.

Examples.

469 Yds. Stuff, at 13d.		742 Yds. at 19d.	
1d. $\frac{1}{2}$	39—1d.	6d	$\frac{1}{2}$ 371
	50/3—1	1d	$\frac{1}{8}$ 61—10
	l. 25 : 8 : 1	of 6d	117/4—10
			l. 58 : 14 : 10 Anf.

Here 469 stands as Shillings, of which I take the 12th Part for the Penny, and add both together : In the next Example, 742 stand as Shillings, of which I take the $\frac{1}{2}$ for the 6d. and the 6th Part of 371, &c.

umber for
er it is the
rt of that
c.

Cotton, at
(7d. 1/2)

4 1/2 Ans.

ce above
Quantity
ence, and
without
ber, and

19d.

Ans.

the 12th
the next
ce the 1/2

$$\begin{array}{r}
 41 \overline{) 2460} \text{ lb. Tobacco, at } 16d. \\
 \underline{820} \\
 3280 \\
 \underline{1. 164} \text{ Answer.}
 \end{array}$$

$$\begin{array}{r}
 \text{Or thus.} \\
 3 \overline{) 2460} \\
 \underline{5820} \\
 1. 164
 \end{array}$$

$$\begin{array}{r}
 120 \text{ Ells Holland, at } 20d. \frac{1}{2} \\
 4d \overline{) 140} \\
 4d \overline{) 140} \\
 \underline{17-6} \\
 \text{of } 4d \overline{) 717-6} \\
 \underline{1. 35 : 17 : 6}
 \end{array}$$

$$\begin{array}{r}
 794 \text{ Bush. of Oats, at } 22d. \frac{1}{2} \\
 6d \overline{) 397} \\
 4d \overline{) 264-8} \\
 \underline{33-1} \\
 1488-9 \\
 \underline{1. 74 : 8 : 9} \text{ Answer.}
 \end{array}$$

Note, That in the second Work of the first Example above, I divide by 15, according to the 9th Rule of the 5th Chapter ; bcause 16d. is the 15th Part of a Pound, as 15 is the 16th Part. Or when the Price is 14, 16, 18, 21, or 22d. under 2s; if you bring the said Prices into 2d. 3d. 4d. 6d, or 8 Pences, you may bring them into Pounds, &c. at one Operation, by taking Parts according to the 2d. Table of Practice, at the Beginning of the Rules of Practice.

Examples.

$$\begin{array}{r}
 7890 \text{ Yds. at } 14d. \\
 \underline{7} \\
 3d \overline{) 5523.0} \text{ Two-pences.} \\
 \underline{1. 460-3}
 \end{array}$$

$$\begin{array}{r}
 988 \text{ lb. at } 15d. \\
 \underline{5} \\
 3d \overline{) 494.0} \text{ Three-pen.} \\
 \underline{1. 61 : 15}
 \end{array}$$

6709lb at 21d.

7

3796 at 22d.

11

$$3d\frac{1}{2} \overline{) 4696,3} \text{ Three-pence } [2d\frac{1}{2} \overline{) 4175,6}$$
l. 587:0:9 Answerl. 347:19:4 Answer

VIII. When the Price given is such a Number of Shillings, or Shillings and Pence, as make an even Part of a Pound, divide the given Quantity by that Part, and the Quotient will be Pounds.

1s. 8d. $\overline{) \frac{1}{12} 374}$ Guild. at 20d.

746 Gal. Spirits, at 2s.

Ans. 31:3:42s. $\overline{) \frac{1}{12} 746}$ l. 74:12 Answer.

In the first of these *Examples* I divide the given Quantity by 12, because 20d. is the $\frac{1}{12}$ of a Pound, and there remains 2, which is two 1s. 8d's, or 3s. 4d. So the Answer is l. 31:3:4.

IX. When at any time the Price is 2s. as in the second *Example* above, the Answer may be known at Sight; for it's but doubling the last Figure towards the right Hand and note it for Shillings; and the other Figures towards the left Hand are Pounds, as above, the double of 6 is 12s. and the two other Figures are Pounds, viz. 74l. in all 74:12.

From this Notion of understanding the Value of any Quantity, at 2s. at Sight, many Things may be expeditiously answered, viz.

Example

Examples.

756 Gal. at 3s. 6d. per Gal.	492 Yds. at 9s. 4d.
<u>75—12 at 2s.</u>	<u>49—4 at 2s.</u>
$\frac{1}{2}$ 37—16 at 1s.	4 times 2 is 8s.
$\frac{1}{2}$ 18—18 at 6d.	<u>196—16 at 8s.</u>
<u>l. 132—06 Answ.</u>	<u>24—12 at 1s.</u>
2s. 4d. $\frac{1}{2}$ 575 lb. Indigo, at	$4d\frac{1}{2}$ 8—04 at 4d.
(3s. 4d.)	<u>l. 229—12 Answ.</u>
<u>l. 96 Answ.</u>	<u>4s. $\frac{1}{2}$ 749 pcs. $\frac{8}{8}$ at 4s.</u>
5s. $\frac{1}{2}$ 296 Yds. Silk, at 5s.	<u>l. 149—16 Answ.</u>
<u>l. 74 Answ.</u>	<u>6s. 8d. $\frac{1}{2}$ 988 Gal. Brandy,</u>
2s. 6d. $\frac{1}{2}$ 973 Florins, at 2s.	(at 6s. 8d.)
(6d.)	<u>l. 329—6—8 Answ.</u>
<u>l. 121—12—6 Answ.</u>	<u>10s. $\frac{1}{2}$ 575 Yds. Br. Cloth,</u>
Here 5 Half-Crowns remain or 12s. 6d.	(at 10s.)
	<u>l. 287—10 Answ.</u>

X. When the Price is Shillings and Pence, or Shillings Pence, and Farthings, and no even Part of a Pound, then multiply the given Quantity by the Shillings in the Price, and take Parts for the rest, and add all together.

L.

Example

Examples.

756lb. Coffee, at 5s. 8d.	436 lb. Cinnamon, at (9s. 7d.
5	9
$\begin{array}{r} d \overline{) 3780} \\ 4 \overline{) 252} \\ 4 \overline{) 252} \\ \hline 428 \overline{) 4} \end{array}$	$\begin{array}{r} d \overline{) 3924} \\ 6 \overline{) 218} \\ 1 \overline{) 364} \\ \hline 417 \overline{) 8-4} \end{array}$
<u>l. 214-4 Answ.</u>	<u>l. 208-18-4</u>
570 Qrs. of Wheat, at (32s. 6d.	746 C. Cheese, at (27s. 4d.
32	27
$\begin{array}{r} 1140 \\ d \overline{) 1710} \\ 6 \overline{) 285} \\ \hline 1852 \overline{) 5} \end{array}$	$\begin{array}{r} 5222 \\ d \overline{) 1492} \\ 4 \overline{) 248-8} \\ \hline 2039 \overline{) 0-8} \end{array}$
<u>l. 926-5 Answ.</u>	<u>l. 1019-10-8 Answ.</u>

XI. When the Price is Shillings and Pence, and no even Part of a Pound, yet many times it may be divided into even Parts; as 7s. 6d. is composed of 5s. and 2s. 6d. and 11s. 8d. of 10s. and 1s. 8d. 12s. 6d. of 10s. and 2s. 6d. 15s. of 10s. and 5s. &c.

Or thus:

205 Gall. Tent, at 7s. 6d.	205
$\begin{array}{r} 3s. \overline{) 51-5} \\ 2s. 6d. \overline{) 25-12-6} \\ \hline l. 76-17-6 \end{array}$	$\begin{array}{r} 2s. 6d. \overline{) 25-12-6} \\ 3 \overline{) 3-12-6} \\ \hline l. 76-17-6 \end{array}$

[3½ Cr. is 7s. 6d.

190 Bar. Argal. at			172 C. Iron, at		
s. d.		(11s. 6d.)	s. d.		(12s. 6d.)
10	$\frac{1}{2}$	95	10	$\frac{1}{2}$	86
1-8	$\frac{1}{12}$	15-16-8	2-6	$\frac{1}{8}$	21-10
<u>L. 110-16-8</u>			<u>L. 107-10 Answ.</u>		

XII. When at any time the Price is an even Number of Shillings, multiply the Quantity by half of the Price and double the first Figure of the Product, and set it apart for Shillings; and the other Figures to the left Hand will be Pounds.

Examples.

79 Bushels Wheat, at 6s.	90lb. Sassafras, at 8s.
3	4
the half 3	
<u>L. 23-14 Answ.</u>	<u>L. 36-00 Answ.</u>
764 C. Suff. Cheese, at 12s.	85 Yards of Cloth, at 14s.
6	7
the half 6	7
<u>L. 458-8 Answ.</u>	<u>L. 59-10 Answ.</u>
326 lb. Mace, at 22s.	623 C. Ginger, at 24s.
11	12
11	12
<u>L. 358-12 Answ.</u>	<u>L. 747-12 Answ.</u>

When the multiplier consists of two Places (when the Price is an even Number of Shillings) and that it cannot well be work'd to have the Product in one Line; after you have done with the Unit Figure, and come to multiply by the second, observe to set the first Figure of the Product just under the second of the first Line; for that doubled and set apart for Shillings, takes up the first Place.

L. 2

756 C.

756 C. of Currants, at 48s.

$$\begin{array}{r} 24 \\ \hline 302-8 \\ 1512 \\ \hline \end{array}$$

l. 1814-8 Facit.

219 C. at 56s.

$$\begin{array}{r} 28 \\ \hline 175-4 \\ 438 \\ \hline \end{array}$$

l. 613-4 Answer.

When the Price is an even Number of Shillings, if it be required to know what Quantity of any thing may be bought for so much Money, it may be known by this short Rule, *viz.* annex a Cypher to the Money, and divide by half of the proposed Price.

Examples.

How many Pounds of Indigo may be bought for 54*l.* at 4s. per lb.

$$\begin{array}{r} 2)540 \\ \hline \text{Answ. } 270 \text{ lb.} \\ \hline \end{array}$$

What Quantity of Cloth at 12s. per Yard may be bought for 236*l.*

$$\begin{array}{r} 6)2360 \\ \hline \text{Yards } 395\frac{2}{3}, \text{ or, } \frac{1}{3} \text{ Answ.} \\ \hline \end{array}$$

How many Gallons of Canary at 6s. per Gallon, may be bought for 250*l.*?

$$\begin{array}{r} 3)2500 \\ \hline 833\frac{1}{3} \text{ Answ.} \\ \hline \end{array}$$

XIII. When the Price is an odd Number of Shillings, work for the even Part, as in the last Rule, and for the odd Shillings take the $\frac{1}{20}$ of the given Number, and add them together, as in the following Examples.

96 Pistoles at 17s.		260lb. China Silk at 21s.	
8		10	
8-1		10-1	
s. 76-16		s. 260-00	
$1\frac{1}{20}$ 4-16		$1\frac{1}{20}$ 13-00	
l. 81-12 Answer.		l. 273-00 Answer.	

XIV. When the Price of the Integer is Pounds, Shillings, and Pence, reduce the Pounds and Shillings into Shillings, and multiply the given Number of Integers by the said Shillings; and then take Parts for the Pence, as before. Or, if the Shillings and Pence make an even Part or even Parts of a Pound, then multiply the Quantity by the Pounds, and take even Parts of a Pound for the Remainder of the Price, and add the Results together. Or, when the Price is Shillings, above 20 and under 60, you may let the Integers stand as Pounds, and (without drawing a Line) take Parts for the odd Money, and add all together.

Examples.

C.		l. s. d.		Or thus:	
426 Turmeric, at 3-12-6				C. l. s. d.	
72		20		426 at 3-12-6	
				3	
852		72			
d. 2982				s. 1278	
$6\frac{1}{2}$ 213				10 $1\frac{1}{2}$ 213	
				2-6d $1\frac{1}{8}$ 53-5	
3088 5					
				l. 1544-5 Answ.	
l. 1544 5 Answ.					

C.	l. s. d.
316 Salt-petre at 4-15-6	
95	20
1580	95
d 284 1/2	
6 1/2 158	
3017/8	
l. 1508-18	

Or thus:

C.	l. s. d.
316 at 4-15-6	
4	
1264	
10 s. 158	
5 79	
6 d. 7-18 Answ.	
l. 1508-18 Answ.	

XV. If the Quantity given hath any odd Weight or Measure annexed to it, as $\frac{1}{4}$, a $\frac{1}{2}$, or $\frac{3}{4}$ (after you have work'd as before, for the whole Number) then take $\frac{1}{2}$, or $\frac{3}{4}$ of the Price, and add it to the other Work,

Examples.

lb.	
256 1/2 Legee Silk, at	
16	(15s. 7d)
1280	1/2 7-2 1/2
d 256	
6 1/2 128	
1 1/2 21-4	
for 1/2 lb. 7-9 1/2	
1/2 399 7-1 1/2	
l. 199-17 1/2	

lb.	
326 1/4 Saffron, at 54s. 8d.	
54 gr.	
1304	1/2 1/2 27-8
d 1630	1/4 1 13-8
6 1/2 163	
2 1/2 54-4	41-0
41-0 for the 3/4	
1786 2-4	
l. 893-2-4	

When you take for 3 grs. of any thing, first take $\frac{1}{2}$ of the given Price, and then the $\frac{1}{2}$ of that $\frac{1}{2}$, and add them together as above, or you may take the $\frac{1}{2}$ and $\frac{1}{4}$ Parts, and add them together; but the other is easier and quickest.

246 1/2

<i>C.</i>		<i>Ells.</i>	<i>s. d.</i>
246 $\frac{1}{2}$	Fustick, at 11s. 6d.	216 $\frac{1}{2}$	Lawns, at 12-9
246		12	
6d $\frac{1}{2}$ 123	$\frac{1}{4}$ 2-10 $\frac{1}{2}$		$\frac{1}{5}$ 2-6 $\frac{1}{5}$
2829		l. 2592	
2-10 $\frac{1}{2}$		6 $\frac{1}{2}$ 108	
		3 $\frac{1}{2}$ 54	
		2-6 $\frac{1}{5}$	
$\frac{1}{5}$ 283 $\frac{1}{2}$ 1-10 $\frac{1}{2}$		275 $\frac{1}{2}$ 6-6 $\frac{2}{5}$	
l. 141-11-10 $\frac{1}{2}$ Answ.		l. 137-16-6 $\frac{2}{5}$	

<i>C.</i>	<i>lb.</i>	<i>s. d.</i>
134 $\frac{1}{2}$	14 Raisins, at 31	6 per Cent.
31		
	$\frac{1}{2}$ is $\frac{1}{4}$	15 9
134	14 $\frac{1}{2}$ lb. $\frac{1}{4}$	3 11 $\frac{1}{4}$
402		
19-8 $\frac{1}{4}$ for $\frac{1}{2}$ C. 14 $\frac{1}{2}$ lb.		19-8 $\frac{1}{4}$
417 $\frac{1}{3}$ -8 $\frac{1}{4}$		
l. 208-13-8 $\frac{1}{4}$ Answ.		

Here the even Parts of Weight must be observed, as they are set down in the beginning of this Chapter: As for the $\frac{1}{2}$ C. you take half of the Price, and for 14 $\frac{1}{2}$ lb. you take $\frac{1}{4}$ of 15s. 9d. as being the $\frac{1}{4}$ of $\frac{1}{2}$ a C. &c.

Sums of this Kind, and many others, may as practically be done by *Multiplication* only (except taking the Parts) as it is taught in the first Chapter of this Book.

*Examples.**C.*75½ Nicorago Wood, at 22 6
8

 l. 9 00 0
 9

 81 00 0
 3 07 6
 0 11 3

 l. 84 18 9

Here I multiply, first by 8, and then by 9; 8 times 9 making 72; and for the 3 odd Hundreds wanting, I multiply the Price by 3, and then I take half the Price for the ½C. and add them together; as by the Work may be seen.

C. *s.* *d.*
 63½ Allom at 12 10 per Cent.
 7

Here I multiply
 by 7, and by 9;
 7 times 9 making
 63, the Quantity.

 4 09 10
 9

 l. 40 08 6
 6 5
 3 - 2 ½

 l. 40 18 1 ½

		Or thus:	
<i>Hhds.</i>		<i>l.</i>	<i>s.</i>
156 Wine at —		12	13 per Hhd.
12			10
<i>s.</i>	1872	126	10
10 $\frac{1}{2}$	78		10
2 $\frac{1}{3}$	15-12		
1 $\frac{1}{2}$	7-16	1265	00
		632	10
<i>l.</i> 1973·08		75	18
		<i>l.</i> 1973 08 Answer.	

96 Fodder of Lead, at —		<i>l.</i> 8	13	4
8				12
<i>s. d.</i>	768	104	00	0
13-4 $\frac{2}{3}$	32			8
	32			
		<i>l.</i> 832	00	0
<i>l.</i> 832 Answer.				

As for short Methods of casting up Bills of Parcels, &c. 'tis best to do them by *Multiplication*, as is directed in that Rule.

Here follow some Questions, with their Answers, for the Learner's Exercise.

75 C. $\frac{1}{2}$ 19 lb. at 4d. $\frac{1}{2}$ per Pound ?	Ans. <i>l.</i> 158 18 1 $\frac{1}{2}$
7108 lb. at 3s. 6d. per C.	Ans. <i>l.</i> 1126 10 1
67108 oz. at 16d. $\frac{1}{4}$ per lb.	Ans. <i>l.</i> 283 12 8 $\frac{1}{2}$
71 lb. 10 oz. 15 dwt. at 5s. 9d. per Ounce.	Ans. <i>l.</i> 248 00 9 $\frac{3}{4}$
319 Yds. at 5s. 6d. per Ell.	Ans. <i>l.</i> 70 03 7 $\frac{1}{2}$
419 $\frac{7}{8}$ Yds. at 4s. 10d. $\frac{1}{2}$	Ans. <i>l.</i> 101 13 9 $\frac{5}{8}$
47 Qrs. at 4s. 9d. per Bush.	Ans. <i>l.</i> 89 06
715 $\frac{1}{4}$ Yds. at 4s. 10d. $\frac{1}{8}$.	Ans. <i>l.</i> 173 04 5 $\frac{7}{8}$
<i>L</i> 5	
59	

59 Ounces, 11dwt, 18gr. at 5s. 7d. per Ounce.

Ans. l. 16-12-8

50lb. $\frac{3}{4}$ of Silk, at 20d. per Oz.

Ans. l. 67-13-4

66 Grofs, at 3s. 9d. per-Dozen.

Ans. l. 148-10-0

56 Load of Hay, at 18d. per Trufs. Ans. l. 151-04-0

Sold 3 Sacks of Rice, Contents, viz.

1—4	1	10	Tare 7	} Clough 2lb. per Sack, Tret 4lb. per 104lb. at 10d. $\frac{1}{2}$ per lb. Neat.
2—3	2	19	—8	
3—4	0	20	—7	

What comes the three Sacks to? Ans. l. 56-4-11

For the deducting of *Tare*, *Tret*, &c. the Learner must have recourse to the VIIth Chapter of this Book.

Sugar, 95C. 1qr. 19lb. Grofs, Tare 12C. 3qrs. 10lb. at 47s. 6d. per C. Neat, what comes the Sugar to at that Rate? Ans. l. 196-2-6 $\frac{1}{2}$.

Other TABLES of the even Parts of a SHILLING, and of a POUND.

Parts of a Shilling.

10d.	is	$\frac{5}{8}$
9	is	$\frac{3}{4}$
8	is	$\frac{2}{3}$
7 $\frac{1}{2}$	is	$\frac{5}{8}$
4 $\frac{1}{2}$	is	$\frac{3}{8}$

Parts of a Pound.

18s.	is	$\frac{9}{10}$
17-6	is	$\frac{8}{10}$
16-8	is	$\frac{5}{6}$
15	is	$\frac{3}{4}$
14	is	$\frac{7}{10}$
13-4	is	$\frac{2}{3}$
12-6	is	$\frac{5}{8}$
8	is	$\frac{4}{10}$
7-6	is	$\frac{3}{8}$
6	is	$\frac{3}{10}$

If the Price of the Integer be at any of the Rates in either of these Tables, multiply the given Quantity by the Numerator, and divide the Denominator, and the Quotient will be the Answer.

Example.

Examples.

d.
10 | $\frac{5}{8}$ | 456lb. Loaf Sugar,
5 (at 10d.

6) 2280

38/0

l. 19 Ans.

Foot.

9d | $\frac{3}{4}$ | 765 Glazing, at 9d.
3

4) 2295

57/3-9

l. 28-14-9 Answ.

C.

9s | $\frac{2}{10}$ | 695 Shomac, at
9 (18s.

1) 0625/5

l. 625-10 Answ.

6s | $\frac{3}{10}$ | 950 Pr. Hose, at
3 (6s.

285/0

l. 285 Answ.

746 Yds. Paving, at
3 ($4d\frac{1}{2}$.

$4d\frac{1}{2}$ | 2238

27/9-9

13-19-9 Ans.

lb.

671 Joppa Soap,
5 (at $7d\frac{1}{2}$.

$7d\frac{1}{2}$ | $\frac{5}{8}$ | 3355

41/9-4 $\frac{5}{8}$

l. 20-19-4 $\frac{5}{8}$

lb.

694 Belladine Silk,
7 (at 17s. 6d.

17s 6d | $\frac{7}{8}$ | 4858

l. 607-5 Facit.

842 lb. Rhubarb, at
2 ($13s. 4d\frac{1}{2}$.

13s 4d | $\frac{1}{2}$ | 1684

l. 561-6-8 Ans.

Other Examples in Practice, promiscuously set, and most expeditiously wrought.

Gal. d.		lb. d.	
d.	4 136 at 15 per Gall	5 7490 at 16 per lb.	
15 is	—	16d. is	—
$\frac{1}{10}$ of	4 384	$\frac{1}{10}$ of	3 1498
a l.	—	a l.	—
	l. 96 Facit.		l. 499 $\frac{1}{3}$ Facit.
8d. $\frac{1}{10}$	7694lb. Tobacco, at	756 Gall. at 5s. 8d.	
of a l.	— (8d. per lb.)		
	l. 256-9-4		
5s. $\frac{1}{4}$	205 Yds. at 7s. 6d.	5s. $\frac{1}{4}$	189
2s. 6d. $\frac{1}{8}$	—	8d. $\frac{1}{10}$	25-4
of a l.	51-5		l. 214-4 Facit.
	25-12-6		
Facit l. 76-17-6		170lb. Raw Silk, at	
		(16s. 8d.)	
40s. $\frac{1}{2}$	125 Pcs at 2l. 5s. 6d.	10s. $\frac{1}{2}$	85
	125 (per Pce.)	6s. 8d. $\frac{1}{3}$	56-13-4
5s. $\frac{1}{4}$	31-5		l. 141-13-4 Facit.
5d. $\frac{1}{10}$	3-2-6		
of 5s.	—		
	l. 284-7-6 Facit.		
75C. $\frac{1}{2}$	Logwood, at	215C. of Hops, at 3l.	
2s. 6d. $\frac{1}{8}$	9-07-6 (22s. 6d.)		(17s. 6d.)
the $\frac{1}{2}$ C.	11-3	860.	
	l. 84-18-9 Facit.	Subt. $\frac{1}{8}$	26-17-6
		l. 833-02-6 Facit.	

Days.	C. qrs. lb.	
365 at 5d. per Day.	12 3 14	Long Pepper, at
6d. $\frac{1}{10}$ 9—02—6		l. 3 10 6
Subt. $\frac{1}{12}$ 1—10—5		12
		42—06—0
l. 7—12—1 Anf.		$\frac{1}{2}$ C. the $\frac{1}{2}$ 1—15—3
		$\frac{1}{4}$ a $\frac{1}{2}$ of the $\frac{1}{2}$ C. 17—7 $\frac{1}{2}$
268 12 lb. at 19d.		14 lb. the $\frac{1}{2}$ of $\frac{1}{4}$ C. 8—9 $\frac{1}{2}$
		Facit. l. 45—07—8 $\frac{1}{4}$
20d. $\frac{1}{12}$ 2234—06—0		lb.
Subt. $\frac{1}{20}$ 111—14—4		6709 at 21d.
l. 2112—12—4		
3796 Yards, at 22d.	2s. $\frac{1}{10}$ 670—18	
	Subt. $\frac{1}{80}$ for 83—17—3	
20d. $\frac{1}{12}$ 316—06—8	3d. over.	
2d. $\frac{1}{10}$ 31—12—8	Answ. l. 587—00—9	
l. 347—19—4		
75 C. at 20s. 8d.		
4d. $\frac{1}{80}$ 1—5		
4d. $\frac{1}{80}$ 1—5		
l. 77—10		

When it happens that the Price of the Integer is a known Part of a Pound, as 17s. 6d. is $\frac{7}{8}$, 13s. 4d. is $\frac{2}{3}$, 16s. 8d. is $\frac{5}{6}$, and 7s. 6d. $\frac{3}{8}$, &c. then multiply the given Number by the Numerator, and divide the Product by the Denominator: Or divide by the Denominator, and multiply by the Numerator. See the following Work.

Example

Examples.

420 Yds. at 7s. 6d.

3

8)1260

l. 157 10 Facit.

Or thus:

8)420

52—10

3

Ans. l. 157—10

479 Ells, at 17s. 6d.

7

8)3353

l. 419 $\frac{1}{8}$ or 2s. 6d.

Or thus:

Subtract $\frac{1}{8}$ l. 52—17—6
from the gi- 7

ven Numb. _____

Facit l. 419—2—6

697 Gall. at 16s. 8d.

5

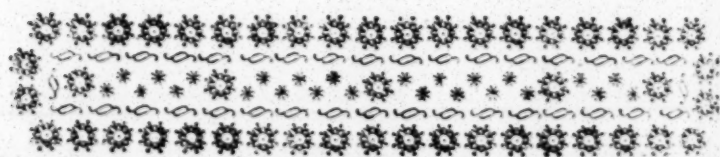
9)3485

l. 580 $\frac{5}{6}$ or 16s. 8d.

Or thus:

Sub. $\frac{1}{6}$ from l. 116—03—4
the given Number. 9

Facit l. 580—16—8



C H A P. XIII.

C O M P A N Y.

THIS Rule teaches (by knowing the Parts of which a Joint Stock is composed, with a supposed *Gain* or *Loss* resulting therefrom by Trade) to estimate or determine each Person's particular Share of the *Gain*, or *Loss*, in proportion to his Principal in the Joint Stock.

By

By this Rule may also a Bankrupt's Estate be divided among his Creditors. Likewise Legacies &c. adjusted, in case of a Deficiency of Assets, or Effects; and many other Things.

I. Questions in this Rule are worked by the *Rule of Three*, there being to be as many several Statings, as there are Members in the Joint-Stock, if none of their Stocks, be alike.

II. The Total Sum of the several Stocks is to be the first Number in the *Rule of Three*; the *Gain* or *Loss*, the second, and each Man's particular Stock, the third.

Example 1.

A and *B* enter into Partnership: *A* puts into Stock 230*l.* and *B* 320*l.* and after twelve Months Trade, they have gained 165*l.* how much must each Person have of the *Gain*, in Proportion to his Money in Company.

230*l.* *A.*
320 *B.*

If 550 gain 165, what 230*l.* *A*'s Stock?

230
—
4950
330
—

550)37950(69*l.* *A*'s Share.

330 . .
—
495
495
—
(0)

Again,

Again, If 550*l.* gain 165*l.* what 320*l.* *B*'s Stock ?

$$\begin{array}{r}
 320 \\
 \hline
 3300 \\
 495 \\
 \hline
 5510 \quad 5280 \quad 1096 \text{ l. } B\text{'s Share.} \\
 495 \cdot \quad 69 \text{ } A\text{'s Share.} \\
 \hline
 330 \cdot 165 \text{ Proof.} \\
 320 \text{ —} \\
 (0)
 \end{array}$$

Here I add their several Stocks together and they make 550*l.* which is the first Number in the *Rule of Three*; the *Gain*, viz. 165*l.* the second; and 320*l.* the Stock of *A*'s the third Number which makes the Stating, which being worked according to Rule, the Answer gives *A* 69*l.* for his Share. Then 'tis again repeated, and then the Stock of *B* 320*l.* is the third Number; and after working the second Stating there arises 96*l.* for the Share of *B* in the *Gain*, which two Shares being added together, make the total *Gain* viz. 165*l.* and is a sure Proof the Work is right, and that each Person had his just Proportion of the Profit.

Example 2.

Three Persons, *A*, *B*, and *C* join in Company; *A*'s Money in Stock is 750*l.* *B*'s 460*l.* and *C*'s 500*l.* and after a certain Time, when they settle their Accounts, find their neat Profit 684*l.* What must each have of the *Gain* ? 750*l.*

$$\begin{array}{r}
 460 \\
 500 \\
 \hline
 \text{If } 1710 \text{ l. gain } 684 \text{ l. what } 750 \text{ l.} \quad \text{Ans. l. } 300 \text{ } A \\
 1710 \text{ gain } 684, \text{ what } 460 ? \quad 184 \text{ } B \\
 1710 \text{ gain } 684, \text{ what } 500 ? \quad 200 \text{ } C \\
 \hline
 \text{Proof. l. } 684
 \end{array}$$

Example

Example 3.

Admit four Persons make a joint Adventure to Sea. *A* sends 60*l.* in Tobacco, *B* 80*l.* in Cloth, *C* 120*l.* in Leather, and *D* 140*l.* in Silk Hose; and after they have disposed of their Returns, their neat Profit amounts but to 72*l.* what is each Man's Share of the said 72*l.*?

	<i>l.</i>	<i>s.</i>
If 400 <i>l.</i> gain 72 <i>l.</i> what 60 <i>l.</i> ?	Ans. <i>A</i>	10--16
If 400 gain 72 what 80?	<i>B</i>	14--08
If 400 gain 72 what 120?	<i>C</i>	21--12
If 400 gain 72 what 140?	<i>D</i>	25--04
	<i>l.</i>	72 00

The common Way of having so many Statings and Workings, as there are Partners in the Concern, being intolerably tedious, I have here set down a much more compendious Method of working Sums belonging to this Rule; and though it is derived from *Decimals*, yet it will well enough answer our End by a *Vulgar Operation*, which is this: Annex a Cypher, or Cyphers, to the middle Number (except it be big enough to divide without, which it very rarely is) and then divide it by the first Number or total Sum of the Stocks; and then by that Quotient, multiply each Person's particular Stock, and the Products will be each Man's proportional Share in the *Gain* or *Loss*. But you must observe, that when you have multiplied each Person's particular Stock by the Quotient aforesaid, you must point, or strike off to the Right-hand so many Figures or Cyphers as you annex Cyphers to the Sum to be divided.

Or *Examples* in this Rule may be shorten'd by finding the proportional *Gain* or *Loss* of one Pound; thus: Bring the *Gain* or *Loss* into Pence, and divide those Pence by the Total of the Stocks, and the Quotient shews what it is *per Pound*; and then the answer may be found by the *Rules of Practice*, &c.

Example

Example by the said proposed Method.

For a Specimen, let us take the first *Example* in this Rule, where the Sum of the Stocks was 550*l.* and the total Gain 165*l.* Here I cannot divide 165 by 550; wherefore I join a Cypher to 165, thus, 1560; and then divide it by 550, and the Quotient is 3; by which I multiply 30*l.* the Stock of *A*, and it produces 690 and the Cypher on the right hand being pointed off, for the cypher annexed to the Dividend, there is left 69*l.* for *A*'s Share in the Gain. Then I multiply *B*'s Stock, 320 by the said Quotient 3, and the product is 960 then cutting off the Cypher, there remains 96*l.* for *B*'s Share, &c. which are the same Answers as by the other Way.

The 2d *Example* worked by this shorter Way.

$$\begin{array}{l} A \ 750 \\ B \ 460 \\ C \ 500 \end{array} \left. \vphantom{\begin{array}{l} A \\ B \\ C \end{array}} \right\} \text{The Gain is } 684*l.*$$

2710)6840(4 the common Multiplier.
6840

(0)
750 *A*'s Stock.
4

l. 300'0 *A*'s Share of the Gain. — — *l.* 300

460 *B*'s Stock.
4

l. 184'0 *B*'s Share of the Gain. — — *l.* 184

500 *C*'s Stock.
4

l. 200'0 *C*'s Share of the Gain. — — *l.* 200

Proof, *l.* 684

The

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Fac, 1.7

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330

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and $\frac{1}{8}$ Par

The third *Example* by the shorter Method stands thus:

<i>l.</i> Parts.	<i>l.</i>	<i>s.</i>
10 8	10 Eight Tenths of a <i>l.</i>	16
14 4	14 Four Tenths of a <i>l.</i>	8
21 6	21 Six Tenths of a <i>l.</i>	12
25 2	25 Two Tenths of a <i>l.</i>	4
Fac, 1.72 0	72	00

Example 4.

Divide *l.* 5760-10 among several Persons, so that *A* may have $\frac{1}{2}$, *B* $\frac{1}{3}$, *C* $\frac{1}{4}$, *D* $\frac{1}{6}$, and *E* $\frac{1}{8}$, and tell me each Man's Part.

In this, and such like Cases, take a Number out of which such Parts may be taken; and take the like Parts of that Number, to find the Numbers you seek, *viz.* each Man's just Proportion, &c. See the following Work and Answers.

20s. Then say, If 27s. 6d.—5760*l.* 10s. what 10s &c.

$\frac{1}{2}$	10	0	Remainders	2094	14	06	<i>A</i>
$\frac{1}{3}$	6	8	18	1396	09	08	<i>B</i>
$\frac{1}{4}$	5	0	12	1047	07	03	<i>C</i>
$\frac{1}{6}$	3	4	9	698	04	10	<i>D</i>
$\frac{1}{8}$	2	6	6	523	13	07	<i>E</i>
			21			2	
	27	6	—				
	12		33.0)6610(2d.	Prin.	5760	10	00
	330						

Example 5.

In like Manner may be done that Question so often critically proposed, *viz.* of dividing 20s. into $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{1}{6}$ Parts. See the following Work.

$$\frac{1}{3}$$

$$\frac{4}{—}$$

12 If 342d. pay 20s. what 120d. &c.

$$\frac{5}{—}$$

$$\frac{60}{—}$$

6 If 342 pay 20, what 90, &c.

360 Common Denominator.

		s.	d.	Parts.
of } 360 }	120	7	0—	72
	90	5	3—	54
	72	4	2—	180
	60	3	6—	36

1st Numb 342 20 0...342 makes 1 to carry, because
the Rule of 3 ————— (is equal to the Divisor 342.

Example 6.

Suppose a Bankrupt's Money and Effects amounts to
811*l.* 10*s.* and he owes to several Persons as follows,
viz.

To Mr. Cruel	—	—	—	—	l. 220	16	6
Mr. Gripe	—	—	—	—	312	00	0
Mr. Hard	—	—	—	—	117	12	6
Mr. Covet	—	—	—	—	106	12	6
Mr. Near	—	—	—	—	200	06	0
Mr. Squeeze	—	—	—	—	124	12	6
					l. 1082	00	0

How much must each Person have of the above-men-
tioned 811*l.* 10*s.* in proportion to his Debt?

l. l. s. l. s. d.

If 1082— 811 10, what 220 16 6?

Answer l. 165 12 4 1/2

Or nearer, by seeing first, what it comes to in the Pound (as mentioned in Page 235) and then work each particular Sum by *Practice*. Thus, Bring 811*l.* 10*s.* into Pence, and then divide them Pence by 1082, the Pounds that are owing, and the Quotient shews what it is in the Pound, *viz.* 15 Shillings. Then proceed for further Solution thus:

What comes *l.* 220 16 6 to, at 15*s.* per Pound?

l. 220 16 6 at 15*s.* per *l.*

$$\begin{array}{r|l} 10 & \frac{1}{2} & 110 \\ 5 & \frac{1}{2} & 55 \end{array}$$

12 4 $\frac{1}{2}$ for the 16*s.* 6*d.*

Ans. *l.* 165 12 4 $\frac{1}{2}$

And so of the rest, see the following Answer. Or shorter by taking $\frac{3}{4}$ of each Person's Debt, because 15*s.* is $\frac{3}{4}$ of a Pound.

Mr. Gruel must have	—	—	<i>l.</i> 165	12	4 $\frac{1}{2}$
Mr. Gripe	—	—	234	00	0
Mr. Hard	—	—	88	04	4 $\frac{1}{2}$
Mr. Covey	—	—	79	19	4 $\frac{1}{2}$
Mr. Near	—	—	150	04	6
Mr. Squeeze	—	—	93	09	4 $\frac{1}{2}$

Proof, *l.* 811 10 0

With Time.

When this Rule hath any Relation to a particular Time, then you must multiply each Man's particular Stock of Money by the respective Times it continues in the Joint-Stock, and add all the Products together; which Total must be the first Number in the *Rule of Three*; the Gain or Loss the second, and each Man's Stock multiplied by his

his Time the third; and then work as before, and as often repeat as there are Partners, &c.

Example 1.

A and *B* enter into Company; *A* puts into Stock 120*l.* for 7 Months; and *B* puts 230*l.* for 10 Months; and in Trading they gain 100*l.* what is each Man's Share, in Proportion to his Stock and Time? See the Work following.

120*l.* *A*'s Stock. 230*l.* *B*'s Stock.
7 Months, *A*'s Time. 10 Months, *B*'s Time.

840 *A*'s Stock and time 2300 *B*'s Stock and Time.
2300

If 3140—gain 100*l.* what 840, *A*'s Stock and Time.
Again,

If 3140—gain 100*l.* what 2300, *B*'s Stock and time,
Parts.

Answer. $\left\{ \begin{array}{l} l. \ 26 \ 15 \ 00 \ \frac{1}{4} \ 1680 \ A \\ \quad \ 73 \ 04 \ 11 \ \frac{1}{2} \ 1480 \ B \end{array} \right.$

Proof, *l.* 100—3140 *A* Far.

Or the Answers may be known by finding a common Multiplier, as directed in Page 235; or by finding the proportional Part of the Gain due to one Pound, as mentioned in the same Page.

Example 2.

Three Persons enter into Partnership, viz. *A*, *B*, and *C*. *A* puts into Stock 65*l.* for 8 Months, *B* 78*l.* for 12 Months, and *C* 84*l.* for 6 Months, and they gain 166*l.* 12*s.* what is each Man's Share, &c?

A's Stock multiplied by 8 produces 520
B's Stock multiplied by 12 gives 936
C's Stock multiplied by 6 produces 504

1960 Sto. & Ti.

Then

Then say,

S. and T. l. s. l. S. and T.

If 1960 gain 166 12 (or 166,6) what 520?

Answ. 44l. 4s. (or 44,2) &c.



CHAP. XIV.

BARTER.

BARTER, or *TRUCK*, is no more than exchanging one Commodity for another, and so to proportion their Rates, as that neither of the Persons may sustain Loss.

Example 1.

Suppose *A* has 144 Ells Linnen Cloth, worth 15*d.* per Ell, which he would *Truck* with *B* for Butter, at 18*s.* 9*d.* per 100lb how many Pounds of Butter must *B* give *A* for the Linnen?

Answ. 960 Pounds.

The concisest Way to answer Questions in this Rule, is first to find the Value of the first Goods mentioned, by the shortest Way of *Practice*; and then to answer it by the *Rule of Three*.

Then say.

$$15d. \text{ is } \frac{1}{16} \text{ of a } l. \left\{ \begin{array}{l} 4) 144 \text{ Ells, at } 15d. \\ \hline 4) 36 \end{array} \right.$$

l. 9 or 180*s.*

Then say,

If 18*s.* $\frac{3}{4}$ give 100*l.* what 180*s.* &c.

Answ. 960 Pounds.

To

To prove the Work, cast up the 960lb. at $2d. \frac{1}{4}$ per lb. (for it is so much per lb. at $18s. 9d.$ per 100lb.) and if it amounts to 9l. the Value of the Linnen, the Work is right. Thus:

$$\begin{array}{r|l}
 2d. \frac{1}{4} \text{ of a } l. & 96,0 \text{ at } 2d. \frac{1}{4} \text{ per lb.} \\
 \frac{1}{4} \text{ or } \frac{1}{8} \text{ of } 2d. & \begin{array}{r} 8 \\ 1 \\ \hline \end{array} \\
 & \underline{1. 9 \text{ Facit.}}
 \end{array}$$

Example 2.

A has Broad Cloths at 10l. 10s. per Piece, and *B* hath Mace, at 12s. per lb. how many Pounds of Mace must *B* give *A* for 24 Broad Cloths? Answ. 420 Pounds.

$$\begin{array}{r}
 24,0 \\
 12 \\
 \hline
 \end{array}$$

If 12s. — 1lb. what 252lb. &c.

Example 3.

A hath 14C. Weight of Sugar. at 6d. per lb. for which *B*. gave him 1C. $\frac{3}{4}$ of Cinnamon, what was the Cinnamon rated at per lb.

$$\begin{array}{r}
 14 \\
 14 \\
 14 \\
 14 \\
 \hline
 112 \quad 6d. \frac{1}{40} \text{ of } l. \quad 156,8 \\
 84 \\
 \hline
 \text{If } 196 \quad \text{Cost } l. \quad 39,4, \text{ what } 1 \text{ lb.}
 \end{array}$$

Answ. 4s.
Ex.

Is an A
Confir
Money;
Money, an
Simple In
cipal only

Example 4.

A and *B* barter, *A* hath 86 Gallons of Brandy, worth 9s. 2d. per Gallon ready Money, but in Barter he will have 11s. per Gallon: *B* hath Serge worth 2s. 1d. per Yard ready Money. *Quere.* How many Yards of Serge must *B* give *A* for his 86 Gallons of Brandy?

The Rule. First find what advance *B* ought to make per Yard for his Serge, in Proportion to what *A* hath done upon a Gallon of his Brandy. Thus:

If 9s. 2d. increase to 11s. what must 2s. 1d. increase to? Answ. 2s. 6d.

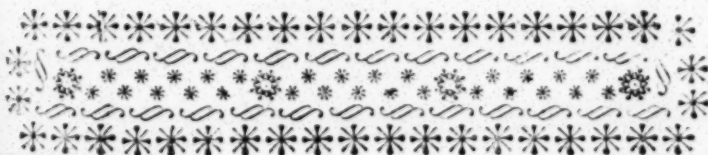
Then see by Practice what *A*'s Brandy comes to at 11s. per Gallon, which will be found to amount to 47l. 6s, then say by the *Rule of Three.*

s. d. Yard. l. s.

If 2 6 buy 1 what will 47 6 buy?

Answ. 378 Yards $\frac{1}{2}$.

And so of any other *Example* in this Rule of this Kind.



C H A P X V.

I N T E R E S T.

IS an Allowance of the Borrower to the Lender, in Consideration of the Use made of the Lender's Money; and therefore Interest sometimes is called Use Money, and this *Interest* is either *Simple* or *Compound*. *Simple Interest* is that which cometh of the *Principal* only; and *Compound Interest* is that which arises

M

from

from *Principal* and *Interest* also, and is therefore called *Interest* upon *Interest*; but this latter being accounted very unlawful, is seldom allowed, but in some particular Agreements, &c. I shall therefore not insist upon it; but as to the former, to wit, *Simple Interest*, I shall endeavour at some practical Rules and Methods to render it easy to the meanest Capacity; and shew also, that by the Methods of working *Interest*, several other useful things are answered, that do not come under that Denomination.

Example 1.

What comes the Interest of a Bond of £. 374 12 9 20, at 6*l. per Cent* for a Year?

Rule, Multiply the Principal Money, by the Rate of *Interest*, be it what it will, and divide by 100. State it thus:

l. p. l. l. l. p. s. d.
If 100*l.* gain 6, what 374 12 9
6

$$\begin{array}{r}
 22 \overline{) 47 \ 16 \ 6} \\
 \underline{20} \\
 27 \ 16 \ 6 \\
 22 \ 47 \ 16 \ 6 \\
 \hline
 9 \overline{) 56} \\
 \underline{12} \\
 6 \overline{) 78} \\
 \underline{4} \\
 3 \overline{) 12}
 \end{array}
 \left. \begin{array}{l} \\ \\ \\ \\ \end{array} \right\} \begin{array}{l} \\ \\ l. s. d. \\ 22 \ 9 \ 6 \frac{3}{4} \frac{12}{100} \\ \\ \end{array}$$

Here I multiply the third Number by the second according to *Multiplication of Money*, and the Product is £. 2247 16 6. which I divide by 100, by cutting off two Figures with a Dash of the Pen, which is dividing by 100, according to the 6th Rule of the 5th Chapter, then I multiply the several Remainders by 20, by 12, and by 4, and still divide by 100, as before and the answer is £. 22-9-6- $\frac{3}{4}$ $\frac{12}{100}$; as may be seen

by the Work above. And the Truth may be proved by stating and working it back again, thus :

L.P. *s.* *d.* *l.l.* *s.* *l.P.*
If 374 12 9 gain 22 9 6 $\frac{1}{4}$, what 100?

Example 2.

What is the Interest of *l.* 826 13 9, for a Year,
at 5 per Cent.

Shorter thus:	41'33 8 9	
$\frac{1}{20}$ 82/6 13 9	20	} <i>l.</i> 31 6 8 $\frac{1}{4}$.
<i>Facit.</i> <i>l.</i> 41/6 08 $\frac{1}{4}$	66'8	
	12	
	8'25	
	4	
	1'00	

In the shorter Method, I consider that the Rate of Interest, viz. 5 per Cent. is the 20th Part of 100*l.* wherefore I take that Part of the Principal Money, which is done only by halving it, thus : The $\frac{1}{2}$ of 8 is 4, and the $\frac{1}{2}$ of 2 is 1, or 41 *l.* and 6 cut off is (for the Cypher in $\frac{1}{20}$) 6*s.* and the 13*s.* 9*d.* reduced into Pence by your Head or Pen, makes 165, and supposing the 5 cut off, the $\frac{1}{2}$ or 16 is 8 Pence; and 5 reduced into Farthings make 20, and supposing the 0 to be cut off from that likewise, the $\frac{1}{2}$ of 2 is $\frac{1}{4}$, and so the Answer is the same with the other, viz. *l.* 41-6-8 $\frac{1}{4}$; and the most concise Method that can be.

Example 3.

What's the *Simple* Interst of
l. 34|8 13 2 at 6 *per Cent*?

$$\begin{array}{r} 17 \quad 08 \quad 7 \frac{3}{4} \\ 3 \quad 09 \quad 8 \frac{3}{4} \end{array} \left. \vphantom{\begin{array}{r} 17 \quad 08 \quad 7 \frac{3}{4} \\ 3 \quad 09 \quad 8 \frac{3}{4} \end{array}} \right\} \begin{array}{l} \frac{3}{5} \text{ for } 5 \text{ per Cent.} \\ \frac{3}{35} \text{ for } 1 \text{ per Cent.} \end{array}$$

Facit, *l.* 20 18 4 $\frac{1}{2}$

Example 4.

What's the Interest of *l.* 746-12-6, at $5\frac{1}{2}$ *per C.*

5

The $\frac{1}{2}$ of 746*l.* &c. $\begin{array}{r} 753-02-6 \\ 373-06-3 \end{array}$

Sooner thus:		41 06 08 9	
746 12 6		20	
		1 28	
$\frac{2}{25}$ 37 06 7 $\frac{1}{2}$		12	
$\frac{1}{10}$ 3 14 7 $\frac{3}{4}$		3 45	
		4	
<i>l.</i> 41 01 3 $\frac{1}{4}$ Facit.		1 80	

} *l.* 41 01 3 $\frac{1}{2}$

Thus by either of these Ways may the Interest of any Sum of Money, for a Year, be found, at any Rate, *per Cent.* Likewise by the same Method of working, may the Provision, Commission, or Fac-torage of any Sum be known: As also Insurance, A-verage, Storage, Brokerage or any thing else, rated at so much *per Cent.*

What

What is the Factorage of Goods bought, or otherwise negotiated, to the Value of $\text{£} 479 \ 16 \ 9$ at 2 per C.

$$\begin{array}{r} 479 \ 16 \ 9 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \ 59 \ 13 \ 6 \\ 20 \\ \hline \end{array}$$

Or thus :

$$2 \text{ per Ct. } \frac{1}{50} 479 \ 16 \ 9$$

$$\begin{array}{r} 11 \ 93 \\ 12 \\ \hline \end{array}$$

$$\text{Facit, £. } \begin{array}{r} 9 \ 11 \ 11 \\ \hline \end{array}$$

$$\text{Ans. £. } 9 \ 11 \ 11$$

$$\begin{array}{r} 11 \ 22 \\ \hline \end{array}$$

What is the Insurance of 2300 £ . at $10\frac{1}{4}$ per Cent.
 $\text{£} 2300$ — 10 per Cent.

$$\begin{array}{r} 115 \\ \hline \end{array}$$

$$\begin{array}{r} 57 \ 10 \\ \hline \end{array}$$

$$24 \ 72 \ 10 \left. \begin{array}{l} \\ \\ \\ \end{array} \right\}$$

$$\begin{array}{r} 20 \\ \hline \end{array}$$

$$14 \ 50$$

$$\begin{array}{r} 12 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \ 00 \\ \hline \end{array}$$

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \text{£. } 24 \ 14 \ 6$$

Or thus :

$$10 \text{ per Cent. } \text{£. } 230$$

$$\left. \begin{array}{l} 10s \ \frac{1}{20} \ 1 \ 3 \\ 5 \ \frac{1}{2} \ 11 \ 6 \\ \hline \end{array} \right\}$$

$$\begin{array}{r} 24 \ 14 \ 6 \\ \hline \end{array}$$

This Method may be of good Use, for taking off 5 per Ct. for prompt Payment in Custom-House Duties and 15 per Cent. the additional Duty on *French* and *East-India* Goods. Admit I were to take off 5 per Ct. from

$$\text{£. } 275 \ 12$$

$$\text{Subtract } \frac{1}{20} 13 \ 15 \ 07$$

$$\text{Ans. £. } 251 \ 16 \ 05$$

Again, take off 15 per Cent. from $\text{£. } 672 \ 16 \ 08$

$$\frac{1}{10} 67 \ 05 \ 08$$

$$\frac{1}{2} 33 \ 14 \ 10$$

$$\text{Subtract } 100 \ 18 \ 06$$

$$\text{Ans. £. } 571 \ 18 \ 02$$

Interest of
at any
method of
or Fac-
ance, A-
e, rated

What

Once more take 25 p. Cent. from $l. 321\ 12\ 4$

5 per Cent. $\frac{1}{5}$ 16 01 $7\frac{1}{4}$
5

Deduct. 80 08 $\frac{1}{2}$ 25 p. Cent.

Ans^r $l. 241\ 04\ 3\frac{1}{4}$

Example 6.

What comes the Interest of $l. 446-12$ to, for 9 Months, at 6 per Cent per Annum?

Here I take the $\frac{1}{2}$ of the Years Interest for 6 Months, and then the $\frac{1}{2}$ of that for 3 Months, and add them together for 9 Months, as in the following Work.

$l. 446\ 12$
6 per Cent.

$26\ 79\ 12$
20

$11\ 12$
12

$l. 26\ 15\ 11\frac{4}{100}$ for a Year.

$11\ 04$ 6 Mon--13 07 $11\frac{1}{2}$ for $\frac{1}{2}$ a Year.
3 Mon---6 13 $11\frac{1}{4}$ for $\frac{1}{2}$ ditto.

$l. 20\ 01\ 11\frac{1}{4}$ for 9 Mon.

Example 6.

To what comes the Interest of $l. 297-12$, at 5 per Cent. for 6 Months?

Answer $l. 7-8\ 9\frac{1}{2}$

$l. 14\ 17\ 7$ for a Year.

Take $\frac{1}{2}$ for } $l. 7\ 08\ 9\frac{1}{2}$ Answer.
6 Month. }

When

When at any Time the Rate of Interest hath $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ annexed, you must first multiply by the whole Numbers, and then take $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$, of the Principal Money, (as is taught in the 13th Rule of the 4th Chapter) and add the two Lines together, and then divide by 100, as before.

Example 7.

What is the Interest of £. 376 12 6
at $4\frac{1}{4}$ per Cent?

For the $\frac{1}{2}$ per Cent take
half of the Principal,

1506	10	0
188	06	3

Answer £. 16-18-11 $\frac{1}{2}$

16	94	16	3
20			
18	96		
12			
11	55		
4			
2	20		

Example 8.

What is the Interest of £. 226 10
at $4\frac{3}{4}$ per Cent.

p. Ct.	679	10
$\frac{1}{4}$	113	05
$\frac{1}{2}$	56	12 6

Anfw. £. 8 9-10 $\frac{1}{2}$

8	9	07	6
20			
9	87		
12			
10	50		
4			
2	00		

Another Way (when the time is odd, or not just a Year) is to multiply the Principal by the Interest of 100*l.* for the nominated time, cutting off two Figures to the Right-hand; as before

Example 1.

What's the Interest of *l.* 234 12 6 for 2 Years, at 5 per Cent. The Int. of 2 Yrs at 5 per Cent. } 10 *l.*

$$\begin{array}{r}
 234 \ 12 \ 6 \\
 \times 10 \\
 \hline
 2346050 \\
 \hline
 20 \ 9 \ 125 \\
 \times 12 \\
 \hline
 23930 \\
 \hline
 300 \\
 \hline
 \end{array}
 \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \text{ } l. \ 23 \cdot 9 \cdot 3$$

Example 2.

What is the Interest of *l.* 312 16 for 5 Years at 6 per Cent. 5 and 6

$$\begin{array}{r}
 312 \ 16 \\
 \times 156400 \\
 \hline
 156400 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 93 \ 84 \ 0 \\
 \times 20 \\
 \hline
 16 \ 80 \\
 \times 12 \\
 \hline
 9 \ 60 \\
 \times 4 \\
 \hline
 2 \ 40 \\
 \hline
 \end{array}
 \left. \begin{array}{l} \\ \\ \\ \\ \end{array} \right\} \text{ } \text{Anfw. } l. \ 93 \ 16 \ 9\frac{1}{2}$$

Here the Interest of 100*l.* for the Time, is 30*l.* therefore I multiply by the Ratio's of 30 viz 5 and 6; as in the Example.

Example

Example 3.

What's the Interest of $l. 428-14$, for 9 Mon. at 4 per Cent.
 The Interest of 100 $l.$ is $3l.$ [Cent.
 for 9 Mon. at 4 per Cent. |

$$\begin{array}{r}
 12 \overline{) 862} \\
 \underline{20} \\
 17 \overline{) 22} \\
 \underline{12} \\
 2 \overline{) 64} \\
 \underline{4} \\
 2 \overline{) 56}
 \end{array}
 \left. \vphantom{\begin{array}{r} 12 \overline{) 862} \\ 20 \\ 17 \overline{) 22} \\ 12 \\ 2 \overline{) 64} \\ 4 \\ 2 \overline{) 56} \end{array}} \right\} l. 12-17-2\frac{1}{2}$$

When the Rate is at $\left\{ \begin{array}{c} 5 \\ 6 \\ 4 \\ 3 \end{array} \right\}$ per Cent. for $\left\{ \begin{array}{c} 12 \\ 10 \\ 15 \\ 20 \end{array} \right\}$ Months.

Then the Interest of any Principal, is just so many Shillings as there are Pounds; therefore only take $\frac{1}{10}$ of the Principal, &c.

Example 1.

What's the Interest of $l. 412 \ 06 \ 9$ at 5 per Cent for 12 Months?

$$\frac{1}{10} 20 \ 12 \ 4\frac{1}{10} \text{ Ans.}$$

Example 1.

What's the Interest of $l. 324 \ 12 \ 0$ at 6 per Cent. for 10 Months?

$$\frac{1}{10} 16 \ 04 \ 7\frac{4}{10} \text{ Ans.}$$

M 5

Ex.

Example 3.

What's the Interest of — $l. 428 \ 16 \ 4$ at 4 *per Cent* for 15 Months?

$$\frac{1}{10} \ 21 \ 08 \ 9\frac{1}{2} \text{ Anfw.}$$

Hence it necessarily follows, that the Interest of any given Principal may be found, by taking Parts for the Time proposed, out of the Time mentioned in the foregoing Table; thus: if the Interest of $l. 412 \ 6 \ 9$ for 12 Months, be $20 \ 12 \ 4 \ 1$, as in page 251, at $12d.$ in the Pound, then for 6 Months it must be $10 \ 6 \ 2\frac{1}{2}$; and for three Months $5 \ 3 \ 1\frac{1}{4}$.

Examples.

What's the Interest of — $20)276 \ 05 \ 9$ for 4 Months at 5 *per Cent*.

$$\begin{array}{r} 13 \ 16 \ 3\frac{1}{2} \\ 4 \text{ Months } \frac{1}{3} \text{ of } \text{---} \\ 12 \text{ Months. } \quad \quad \quad l. \ 4 \ 12 \ 1 \text{ Anf. for 4 M.} \end{array}$$

Again, what's the Interest of $20)157 \ 09 \ 0$ for 5 Months, at 6 *per Cent*.

$$\begin{array}{r} 7 \ 17 \ 5\frac{1}{2} \\ 5 \text{ Months } \frac{1}{4} \text{ of } \text{---} \\ 10 \text{ Months. } l. \quad 3 \ 18 \ 8\frac{1}{2} \end{array}$$

And so for 4 or 3 *per Cent*. for 15 or 20 Months, in the same Manner.

When the *Principal Money* is any Number of Pounds, without Shillings or Pence, then it may be done by the following Method of working.

Example

Examples.

What's the Interest of 40*l.* for 7 Years, 5 Months, and 26 Days, at 6 per Cent per Annum?

Years. Mon. Days.

7 5 26

12 Months in a year.

89

30 Days in a Month.

2696

40 Principal Money:

100)1078/40

Groats 60)107/8

in all.

l. 17 58 Groats, or 19*s.* 4*d.* and 1*d.* $\frac{1}{2}$ for the Fraction.

Here the Time is set down, and multiplied by 12, the Calendar Months in a year, and the odd Months taken in, and then by 30, the supposed Days in a Month, and the odd Days taken in likewise, which Product of Days, is multiplied by the Principal Money, viz. 40*l.* which Product is divided by 100, and then that Quotient by 60, the Groats in a Pound, and the Remainder is Groats, viz. 58 which is 19*s.* 4*d.* and 1*d.* $\frac{1}{2}$ for the Fraction in all, l. 17-19-5 $\frac{1}{2}$: As in the Work.

Example.

What is the Interest of 590*l.* for 3 Years, 7 Months, and 19 Days, at 6 per Cent. per Annum?

M 6

Years.

Years. Mon. Days.

3 7 19
12 Months in a Year.

43
30 Days in a Month.

1309
590 Principal Money.

117810
6545

1|00)7723|10
6|0)772|3

Anfw. l. 128.43 Groats, or 14s.4d.

In all, l. 128-14-4.

There is also another Way of calculating *Interest*, by Days, which is thus : Bring the Principal Money into Pence, then multiply these Pence by the Days it is out at Interest, and if the Rate be at 6 *per Cent.* then divide by 6083, which is what is produced by the Days of the Year multiplied by 100, and divided by the Rate of Interest ; but if the Rate be 5 *per Cent.* then divide by 7300.

Example.

What is the Interest of 150*l.* for 10 Months and 24 Days, at 5*per Cent. per Annum* ?

l. 150

<i>l.</i> 150	<i>Mo. Days,</i>
20	10—24
	30
3000	
12	324
	12)
36000	73100)116640,00(1597
324 Days at Interest.	133—1
144000	Ans ^w , <i>l.</i> 6-13-1
72000	
108000	
11664000	

Another Rule by Days.

Multiply these three Numbers continually, *viz.* the given Interest of 100*l.* for a Year; the Principal whose Interest is required: And lastly, the Number of Days required; and the last Product is to be reserved for a dividend. Then multiply 365 Days by 100, (which is only annexing two Cyphers) and let that product be your Divisor; (which serves for all Rates) and then divide as usual, and the Quotient will be the Interest sought.

Note here, That the two Principals, *viz.* 100*l.* and the other proposed, are supposed to be of one Denomination: also the Interest required will be of the same Name with the given Interest of 400*l.*

Example.

What is the Interest of 400*l.* for a Week, or 7 Days, at 6 per Cent, per Annum?

$$\begin{array}{r}
 365 \\
 100 \\
 \hline
 36500 \text{ Divisor}
 \end{array}
 \qquad
 \begin{array}{r}
 400 \\
 6 \\
 \hline
 2400 \\
 7 \\
 \hline
 16800 \text{ Dividend.}
 \end{array}$$

Answ.

$$36500 \overline{) 16800,000} (4602 \text{ or } 9s. 2d. \frac{1}{4}$$

Here, in valuing, the Farthings are always lessened by one.

When the Rate is *5s. per Cent.* take the $\frac{1}{4}$ of the Principal, and work as before.

What is the Brokerage of *l. 465 12 6*
at *10s. per Cent.*

$$\begin{array}{r}
 \frac{1}{4} \text{ } 2 | 32 \quad 16 \quad 3 \\
 \hline
 20 \\
 \hline
 6 | 75 \\
 12 \\
 \hline
 6 | 56 \\
 4 \\
 \hline
 3 / 00
 \end{array}$$

Answer *l. 2-6-6 $\frac{3}{4}$*

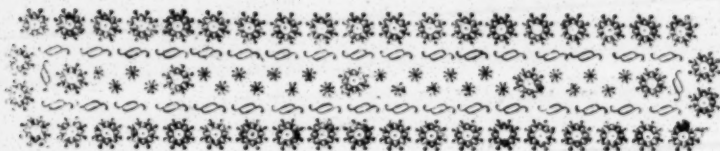
If you would know what any Sum comes to, at 30, 40, or 50 *per Cent.* first see what it comes to at 10 *per Cent.* and then multiply that Answer by 3, 4, or 5, &c.

Ex-

Example.

What comes *l. 726 10 6* at *40 per Cent*?

$$\begin{array}{r}
 \text{72} \overline{) 65 \ 05 \ 0} \\
 \underline{13 \ 05} \\
 \text{1, 72-13-0} \frac{1}{2} \text{ 10 per Ct. } 20 \\
 \underline{4} \\
 \text{1, 290-12-2 Ans. } 12 \\
 \underline{60} \\
 \underline{4} \\
 \text{2!40}
 \end{array}$$



C H A P. XVI.

D I S C O U N T,

IS when a Sum of Money hereafter due, is satisfied by paying down so much present Money, which if put to Interest (at such a Rate, and for such a Time) would increase itself to the Sum first due.

Example 1. What is the *Discount* of *l. 487:12* for six Months, at *6 per Cent per Annum*?

To answer this, and other Sums of the same Kind, the general Rule is to make 12 Months the first Number in the *Rule of Three*, the Rate of *Interest* the second, and the discounted Time the Third.

If 12 Months give 6*l.* what 6 Months?

$$\begin{array}{r}
 6 \\
 \underline{12 \ 36} \\
 3 \text{ To be added to } 100\% \text{ the first} \\
 \text{Number}
 \end{array}$$

Number in the next Work. Then say again. If 1031: abate 3*l.* what *l.* 487-12. Answ. *l.* 14-4 *Discount.* See the following proof.

After I find the Discount to be *l.* 14-4, I deduct it from the Sum first due, viz. *l.* 487-12, and the Remainder is the present Money to be paid down: And for the proof of the Assertion in the first Rule, I take the Sum to be paid down, and calculate it at 9 *per Cent.* the Rate of Interest proposed, and the Answer is *l.* 28-8 the Interest for a Year; the half of which for 6 Months, (the Time discounted) is *l.* 14-4, the *discounted Sum.* As by the following Work.

<i>l.</i> 487	12 first due
14	04 discounted

473	08 to pay down
	6 <i>per Cent.</i>

28	42 0
	20

From whence it is manifest, no one allows Interest for any more Money than he receives.

8 40
Interest for a year *l.* 28 8.

 $\frac{1}{2}$ for 6 months, *l.* 14 4 proof.

Example 2. What is the discount of 275*l.* 10*s.* for 7 Months, at 5 *per Cent. per Annum*?

<i>5<i>l.</i> per Cent.</i>			
6 Months	$\frac{1}{2}$	2	10
1 Month	$\frac{1}{6}$	0	08 4

		12	18 4

If l. 102-18-4 abate l. 2-13-4, what l. 275-10?

Answ. l. 7-16-1.

First due, l. 275-10

Discounted, 7-16-1

Paid down, 267-13-11

5 p. C.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Interest	13	7	8 $\frac{1}{4}$
6 Mo. $\frac{1}{2}$	6	13	10
1 Mo. $\frac{1}{8}$	1	02	03
Proof.	7	16	01

12	38-09-07
20	
7	69
12	
8	35
4	
1	40

Example.

Bought Goods to the Value of, l. 109-10, on 9 Months Discount, at 6 per Cent per Ann, what must be paid down?

6l. per Cent

6 Mo. $\frac{1}{2}$	3	00
3 Mo. $\frac{1}{4}$	1	10
	4	10
	100	

If 104 10 abate l. 4 10, what 109 10?

Answ. l. 4-14-3

4 14 3

Answer, to be paid down, l. 104 15 9

Example

Example 4.

Sold Goods amounting to l. 217-12 on two 3 Months Discount, (that is, half at 3 Months, and the other half 3 Months after that) at 5 per Cent per Annum, what must be paid down?

5l per Cent.

————— If 101-05 abate l. 1-5 wt. 108 16
 3 M. $\frac{1}{4}$ 1 5 Answ. l. 1-06-10 Disc.
 100 0 l. 217-12 }
 ————— 108-16 } 2 Parts.
 101 5

Again.

If 102-10 dif. l. 2-10, wt l. 108-16
 Answ. l. 2 13 0 Disc.
 217 12 val. fold

5 per Cent
 ———— l. 108 16 for 3 m. 1 06 10 Disc.
 6 M. $\frac{1}{2}$ 2 10 108 16 for 6 m. 2 13 00 Disc.
 100 00
 —————
 102 10 Total Discount, 3 19 10
 —————
 Paid down, l. 213 12 02 Answ.

In the foregoing Example, I first divide the given Sum into two equal Parts, by taking the half of it; then for 3 Months, I take $\frac{1}{4}$ Part of the Rate, viz. 5 per Cent. and it makes 1l. 5s. Then I add that Facit to 100l. and make the first *Stating*, saying, If l. 100-5 Discount l. 1-5, what l. 108 16? and the Answer is l. 1-6-10, for the first 3 Months Discount. Then for 6 Months I take the $\frac{1}{2}$ of the Rate, and it makes l. 2-10: Then I say again, if l. 102-10 abate l. 2-10, what l. 108-16? and the Answer is l. 2-13 for 6 Months Discount. Then I add the two Discounts together, and subtract the Total from the Sum first due, and the Remainder is l. 213-12-2 to be paid down presently. Which may be seen by the Work.

When

When the Payments are to be made at three several, times, then divide the given *Sum* into Three equal Parts, and work as before; and if at 4 Payments, then divide the Sum into 4 equal Parts, &c.

There is another and better Way, when the Rate is at 6 *per Cent*. Discount, which is thus:

Bring the given Sum into Pence, and then multiply those by the time, which Product divide by 200 and the Time added together, and the Quotient will be the Answer in pence, which reduce into Pounds, &c.

Example 3.

For a Trial, let us take the first Example in this Rule, *viz.*

What is the Discount of l. 487 12
for 6 Months at 6 *per Cent*

	9752
	12
	117024 Pence
	6 Months Time
200	
6	
Divisor, 206	206)702144(3408 Pence.
	618
	12)3408 Pence.
	841
	824
	284
	1744
Disco. l. 14 4	1648
	(96)
	l. 487 12 First due.
	41 04
	Anf. l. 473 08 to pay down

A Third

A third Way of discount is to multiply 12 Months by 100 (which is only annexing two Cyphers to 12) and divide the product by the Rate of Discount, and to that Quotient add the Time proposed; which Sum reserve for a Divisor; then multiply the Sum to be discounted by the proposed Time, and divide that Product by the above mentioned Divisor.

Example 6.

What is the Discount of l. 487-12, for 6 Months, at 6 per Cent. per Annum, (the first Example of this Rule ?)

	12	Sum to be	} l. 487.12
	100	discounted	
Rate—			
6)1200			206)2925-12(14 l.
			206
200			
Time added 6			865
			824
Divisor, 206			
			41
			20
Answer, l. 14 4s.			
to be discounted.			832(4 s.
			824
			(8)

Example 7.

What present Money will discharge a Debt of 122l. 1s. 4d. due at 3 Months, discounting after the Rate of 6 per Cent per Annum? Answ, l. 120-15-1 $\frac{1}{2}$

After the last Method of Operation.

Divisor, 203)367 14(1 16 2 $\frac{1}{2}$, Discount.
 &c. .

Ex-

Example 8.

What is the Discount of l. 275-10, for 7 Months
at 5 per Cent per Annum

Answ. l. 7-16-1 $\frac{1}{2}$

As before.

l. s l. s. d.
Divisor, 247)1928 10(7 16 1 $\frac{1}{2}$ Discount
 &c.

For	{	2	}		{	600	}	
		3				400		
		4				300		
		5				240		
		6		per Cent.		200		with the Time
		7		Discount.		171		added, is the
		8				150		Divisor.
		9				133		
		10				120		

When the Discount of any Sum is at any of the Rates in the Table above, viz. from 2 to 10, then the opposite Numbers, with the Time of Discount added to them, will be proper Divisors for your intended Purpose, and are found by dividing 1200 by the Rate of Discount; according to the Rule of the third Method of Discount.

If the Discount be, 20, 30. or 40 per Cent. then cut off a Cypher from 600, 400, 300, &c. and add the Time to 60, 30, or 40, for the Divisor, &c.

Example 9.

What is the Discount of l. 212-15, for 3 Months,
at 40 per Cent per Annum?

According to Rule, I add 3 (the Time) to 30, and it makes 33 for a Divisor,, &c.

212 15
 3

33)638 05 l. 19-6-9 $\frac{1}{11}$, Answ.
 &c.



C H A P. XVII.

E X C H A N G E.

IS the receiving of Money in one country, or Nation, and paying it again in another, Value for Value, having respect to the several Species of Coin, or Money of each Nation-

Exchange of Coins is like the Business of Exchanging or bartering of Goods, and depends on a clear Understanding of the *Golden Rule*, to find what Sum of one Country's Money will be equal in Value to any proposed Sum of another Country's Money: In order to which, it is very necessary to have at all times a true Account of the just Values of those foreign Coins that are to be exchanged, as they are compared in Value to our *English*, at all times, as abovesaid, because the *Par* of Exchange differs almost every Day, from *London* to other Countries; that is, it rises and falls, &c.

The Way of working *Exchange* is, either by the *Rule of Three* or by *Practice*, and most commonly by the latter.

London exchanges with *Holland*, *Flanders*, &c. upon so many Shillings and Pence *Flemish* for the Pound Sterling; the *Par* being 33*s.* 4*d.* *Flemish*

Dutch Money.				Sterl	Va.
2 Groats, 1 <i>Stiver</i>	—	—	—	<i>s.</i>	<i>d.</i>
1 <i>Stiver</i> ,	—	—	—	0	1 $\frac{1}{2}$
6 <i>Stivers</i> , 1 Skilling <i>Flemish</i> ,	—	—	—	0	7 $\frac{1}{2}$
20 <i>Stivers</i> . 1 <i>Guilder</i> ,	—	—	—	2	0
6 <i>Guilders</i> 1 Pound <i>Flemish</i> of 20 <i>s.</i>	—	—	—	12	0
33 <i>s.</i> 4 <i>d.</i> <i>Flemish</i> , or 10 <i>Guilders</i> ,	—	—	—	20	0
A common <i>Dollar</i> ,	—	—	—	3	9
A Specie <i>Dollar</i> ,	—	—	—	5	0

Example

Example 1.

Remited from *London* to *Amsterdam*, a Bill of Exchange of *l. 285-10s Sterling*, the Exchange at *33s. 9d. Flem. per Pound Ster.* how many *Guilders Flemish* must the Bill be drawn for? Answ. *2890 Guilders 13 Stivers.* Work'd thus;

If *20s Ster.* give *33s. 9d. Flem.* what *l. 285 10 Sterl. ?*

12	20
405	5710
	405
	28550
	228400
	210)23125510
	2 Groats 1 Stiver 2)115627-10
	20 Stivers 1 Guilder 2'0)578113
	Answer, 2890 13

When you would know your Gain, or how much the Exchange is in your Favour, subtract the *par* from the Course, or Price of the Exchange, and the Difference is the Gain *per Pound Flemish*, as here is but *5d.* And so the contrary for Loss, &c.

Example 2.

A Merchant in *Rotterdam* remits a Bill of Exchange of *7621 Guilders, 7 Stivers*, to be paid in *London*, how much *Sterling* Money must the said Bill be drawn for, the Exchange at *33s. 4d. Flem. per Pound Sterling.*

Answ. *l. 762 2 8.*

If

Guild. Stiv.

If 33s. 4d. *Flem.* gives 20s. *Ster.* what 7621 7

12	12	20
400	240	152427

2 Groats,

504854
240

12194160
609708

4|00)731649|60

12)182912

2|0)1524|2--8

Answ. l. 762-02-08

Sterling Money may be brought into *Flemish* Money by *Practice*, thus: Consider how much the Rate of Exchange is above a Pound *Sterling*, which reduce to the Parts of a Pound, and take those Parts of the *Sterling* Money. and add them to the *Sterling* Money which Total multiply by 6, because 6 *Guldae*. make a Pound *Flemish*, and the Product will be the Answer.

Example

The Answer to the 2d Example of *Flemish* Money, reduced to *Sterling* Money, is

l. 762 2 08

254 0 10 $\frac{2}{3}$ 254 0 10 $\frac{2}{3}$

Here the Difference is 13s. 4
or $\frac{2}{3}$ of a l. wherefore I take $\frac{2}{3}$ of
l. 762-2-8, and add the Results to
it, and it makes 7621 *Guilders*, 6
Stivers, 8 *Pennicks*, or 1 *Groat*;
as by the *Rule of Three*,

1270 4 05 $\frac{1}{3}$

6

Guil. 7621 6 08

Or

Or *Flemish* Money may be brought into *Sterling* Money, by bringing the Course or Rate of Exchange into Pence for a Divisor; and the *Flemish* Money into Pence likewise for a Dividend; and the Quotient will be the Answer in *Sterling* Money.

Example 3.

For how much *Sterling* Money must a Bill be drawn for Goods bought in *Holland*, amounting to 11715 *Guild. 12 Stivers*, the Exchange at 34s. 8d. *Flem.* per *Pound Sterling*.

<i>s d.</i>	<i>Guild.</i>
34 8	11715 12 <i>Sti.</i>
12	40 Groats.
416 Divif.)	468624 (l. 1126-10s. <i>Ster.</i>
	(208) Remainder.
	20
	4160 (10s. <i>Ster.</i>
	4160

London exchanges with *France* upon the *French* Crown, whose *Par* is 54d. that is, to pay so many Pence, or Shillings and Pence, for the *French* Crown.

<i>French Money.</i>	Val.	<i>Ster</i>
	<i>s.</i>	<i>d.</i>
12 Deniers 1 <i>Soulz</i> , — — — —	0	0 $\frac{1}{4}$
20 <i>Soulz</i> 1 <i>Livre</i> . — — — —	1	6
3 <i>Livres</i> 1 <i>Crown</i> . — — — —	4	6

Example 4.

If I draw a Bill per Exchange l. 210-17-10 *Sterling*, to be paid in *Paris*, the Exchange at 57 d. $\frac{1}{8}$, for how many Crowns must I draw the Bill?

Ans. 886 *Fr. Gr.* 0 *Liv*, 1 *Soulz*.

N

12

Or

d. Fr. Cr. l. s. d.
 If $57\frac{1}{3}$ — 1 — what 210 17 10
 8 3 Liv. 20

457 3 4217
 20 Sol. 12
 60 50614
 8 Eights.

404912
 60 Second Numbers.

457)24294720(53161 Soulz.
 2 Fr. Crowns 60 Soulz 6,0)53161
 Li. Soulz.
 Fr. Cr. 886 00 1 Answ.

Example 5.

Admit a Bill drawn in *Lyons*, and payable in *London* for 1510 Crowns, 2 *Livres*, 10 *Soulz.* how much *Eng-lish* Money comes it to, the Exchange at 55 d. $\frac{1}{8}$?

Answer l. 347 0 4 $\frac{5}{8}$

Again, suppose a Merchant in *London* buys Goods for another in *Calais*, to the Value of l. 102.4 *Sterling*, for which he is to draw a Bill on him in *Calais*; for how many Crowns must the Bill be drawn? Ans. 438 Fr. Cr.

s. Fr. C. l. s.
 If $4\frac{2}{3}$ — 1 — 102 4

3 20

14

Here the first and third
 2044 Numbers are brought into
 3 Thirds, and then I divide

by 7 and 2, the *Ratio's* of
 7)6132 14, &c.

2)876

Answ. 438 Crowns,

London

London exchanges with Spain upon the Pieces $\frac{3}{8}$, at 54d. Sterling.

<i>Spanish Money.</i>	<i>Sterl. Val.</i>
	<i>s. d.</i>
1 Meroid — — — — —	0 0 $\frac{1}{2}$ $\frac{1}{4}$
34 Meroids, 1 Rial formerly 6d.) —	0 4 $\frac{3}{4}$
11 Rials Plate, 1 Ducat — — — —	4 4
10 Rials Plate, 1 Pce. $\frac{8}{8}$ — — — —	4 0

Example 6. How many Pcs. $\frac{8}{8}$ at 48d. $\frac{1}{4}$, will answer a Bill of l. 344-11-8 $\frac{1}{2}$ Sterling? Answ. 1714.

Example 7. 24690 Rials Plate, how many Pcs. $\frac{8}{8}$, and Pounds Sterling, the Exchange at 4s. 6d. per Pce. $\frac{8}{8}$?

Answer, $\left\{ \begin{array}{l} 2469 \text{ Pcs. } \frac{8}{8} \\ \text{l. } 555-10-6 \text{ Sterling.} \end{array} \right.$

London exchanges with Portugal upon the Millrea of about 5s. 6d. to 5s. 7d.

<i>Portugal Money,</i>	<i>Sterl. Val.</i>
	<i>s. d.</i>
12 $\frac{1}{2}$ Reas — — — — —	0 1
1000 Reas 1 Millrea — — — — —	6 8
1 Fefton. — — — — —	1 3

Example 8. How many Millreas must a Bill be drawn for, to pay l. 125-11-11 $\frac{1}{4}$ Sterling, the Exchange at 5s. 6d. $\frac{1}{4}$ per Millrea? Answ. 455 Millreas.

If 5s. 6d. $\frac{1}{4}$ — 1 — what l. 125-11-11 $\frac{1}{4}$?

Answer 455.

Example 9. How many Pounds Sterling, &c. must a Bill be drawn for, to answer 500 Millreas, the Exchange at 5s. 5d. $\frac{5}{8}$ per Millrea? Answ. l. 136-14-4 $\frac{1}{2}$.

Example 10. How many Pounds Sterling, &c. must a Bill be drawn for, to answer 600 Millreas, 550 Reas, at 5s. 7d. per Millrea? Answ. l. 167-13-0 $\frac{1}{4}$.

London exchanges with *Venice* upon the *Ducat* of 52d. and with *Leghorn* upon the *Dollar*, or *Pes* of $\frac{8}{8}$ of 54d.

Italian Money.

	Sterl. Val.
½ <i>Livre</i> at <i>Leghorn</i> — — — — s. 0 9	
1 <i>Crown</i> current at <i>Florence</i> — — — — 5 3	
1 <i>Ducat de Banco</i> at <i>Venice</i> — — — — 4 4	
1 <i>St. Mark</i> at ditto — — — — 2 10	
1 <i>Palermo Florin</i> — — — — 2 6	

When the Comparifon is made between *Foreign Coins* of one Country and another, fuch Questions may be answered by the *Single Rule of Three Inverfe*.

Example 11.

How many *Spanish Ducats*, at 4s. 4d. must be drawn for 700 *Rex Dollars* at 5s. 6d.

If 700 — 5s. 6d. — 4s. 4d.

12 12

66 52

700 —

52)46200(888 $\frac{14}{32}$ Answer,

416 ..

460

416

440

416

(24)

C H A P.

Cha



IF I
Ya
do I g
First
Price b
tice cas
as unde

6a
4d

Anfw.

Example
for l. 81-
l. 21-17-6
Here th
Cost, whic
If 750 E
Answer wil
he sell it pe



C H A P. XVIII.

P R O F I T and L O S S.

Example 1.

IF I buy 220 Yards of Broad Cloth, at 8s. 6d. per Yard, and sell it again at 10s. 4d. per Yard, what do I gain by the whole?

First find the Difference by *Subtraction*, between the Price bought, and the Price sold for: then by *Practice* cast up the Number of Yards by that Difference, as underneath.

s.	d.
10	4 Sold for
8	6 Bought for
1	10 Difference.

220 Yards at 1s. 10d. Or thus:	
6d. $\frac{1}{2}$	110
4d. $\frac{1}{3}$	73-4
40/3 4	Subtract $\frac{1}{110}$
20	22
1	16
3	4
Answ. l. 20-3-4 Total Gain.	20 03 4

Example 2. If a Drapper buy 750 Ells of *Holland* for l. 81-5, how must it be sold *per* Ell, to gain l. 21-17-6 in the whole? Answ. 2s. 9d.

Here the intended Gain must be added to the Prime Cost, which makes l. 103-2-6. Then say,

If 750 Ells cost l. 103-2-6, what 1 Ell? and the Answer will be 2s. 9d. *per* Ell. And for so much must he sell it *per* Ell, to gain l. 21-17-6 in the whole.

And

And for Proof, see by *Practice* what 750 Ells come to, at 2s. 9d. and you will find it amount to l. 103-2-6.

Example 3. Admit a Merchant to buy Goods to the Value of 425l. and offers them again for l. 15 per Cent. Profit, what come they to? *State it thus:*

If l. 100 gain 115, what l. 425	115
Or thus:	
425 at 15 per Cent.	2125
4 Hundred under 15 per Cent.	425
60	425
25 is $\frac{1}{4}$ of 100	3 15, or $\frac{1}{4}$ of 15l.
	488 75
	20
63 15 Profit	
Add 425-00 Prime Cost.	15/00
	Answ. 488 15

Anf. l. 488-15 What they must be sold for, as before.

Example 4. If I buy 500 Pair, of Silk Hose, at 8s. 6d. per Pair how much must I sell them for per Pair, to gain 20 per Cent.

First see what they come to at 8s. 6d. per pair; thus:

500 Pair, at 8s. 6d.
8
4000
6d $\frac{1}{2}$ 250
425/0
Answer l. 212-10

Then

Chap.

Th

Then

Exa
that p

Anfw. A

A Pe
times as
multiply
you gain
consider
or $\frac{1}{2}$, &
will be v

Exam
Profit,
wherefor

Then see what l. 212-10 comes to at 30 per Cent.
10 per Cent.

$$\begin{array}{r} 21/25 \cdot 00 \\ 20 \end{array}$$

5100

l. 21 5 10 per Ct.
3

30 per Ct. Profit, l. 63-15 | Answ.
prime cost, 212-10 | add

l. 276 05

Then say, If 500 Pair cost l. 276 5, what 1 Pair?
Answ. 11s. d. $\frac{2}{3}$

Example 5. An Half penny in the Shilling, what is
that per Cent?

l. 100
20

$\frac{1}{2}$) 2000 Shillings.

12) 1000

8|3-4

Or thus

4) 100

6) 25

l 4-3-4

Answ. l. 4-3-4 per Cent.

A Penny in a Shilling is as much again; 2d. four times as much; 3d. six times as much &c. So you may multiply it either by 2, 4, or 6, to know how much you gain per Cent. at those Rates in a Shilling, &c. Or. consider what Part of a Shilling your Profit is, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, or $\frac{1}{5}$, &c. and take that Part of 100l. and the Quotient will be what such Profit in a Shillings makes per Cent.

Example 6. As suppose 2d. in the Shilling is your Profit, Two-pence we know is the $\frac{1}{5}$ of a Shilling, wherefore I take the 5th Part of 100l. thus:

N 4

6) 100

6)100l.

Ans. 16-13-4 *per Cent.*

In the last Example, $\frac{1}{4}d.$ in the Shillings was l. 4-3-4 *per Cent.* where if you multiply by four, the Halfpence in 2d you'll find the same Answer l. 16-13-4 Proof. And so the contrary.

Again admit I gain $3d\frac{1}{2}$, or $5d.$ in the Shilling, what is that *per Cent*?

Here in regard that $3d\frac{1}{2}$ is $\frac{7}{4}$ and $5d.$ $\frac{5}{4}$ of a Shilling I multiply 100 by the Numerator, and divide by the Denominator, according to the 4th Table at the Beginning of the Rule of *Practice*, thus:

$\begin{array}{r} 100 \\ 7 \text{ Halfpence } 5 \text{ Pence in the } 1s. \text{ i.e. } \frac{5}{4} \\ \hline 4)700 \\ \hline 6)175 \end{array}$	$\begin{array}{r} 100 \\ 12)500 \\ \hline 1.41\frac{8}{12} \text{ or } \frac{2}{3}, \text{ i.e. } 13s. 4d. \end{array}$
--	---

Ans. l. 2-9 $\frac{1}{8}$, or 3s. 4d.

As whatever Part of a Shilling is your Profit, the same *per Cent.* will be your Profit also: so on the contrary whatever Part of 100l. is your Profit, the same Part of a Shilling will be your Profit likewise. As suppose your Gain be 25 *per Cent.* which is the 4th Part of 100l. so your Gain in a Shilling will be 3d. at the Rate of 25 *per Cent.* for as 25 is the 4th Part of 100l. so is 3d. of 12d.

Example 7. If I propose to get in any Goods 20l. *per Cent.* Profit, what is that in a Shilling? 20l. is the 5th Part of l. 100 wherefore take the 5th. Part of a Shilling for the Profit; thus:

$$\begin{array}{r} 5)12d. \\ \hline 2\frac{1}{5} \end{array}$$

Example

Example 8. Suppose I have Goods to the Value of l. 415-12-6, that come to a bad Market, and know that they impair by lying, I therefore am obliged to sell them at 12 *per Cent.* Loss, what come they to?

Here the Loss must be subtracted from 100l. and the Remainder is the middle Number.

From 100	If 100——	38l. what	415	12	6
take 12		Answer	365	15	0
88		Lost in all, l.	49	17	4

Or thus: See-what l. 415-12-6, comes to at 12 *per Cent.* and subtract that from the cost of the Goods.

l. 415-12-6
12

l. 49|87-10
20

s. 17|50
12

d. 6|00

From l. 415 12 6
Take 49 17 6

Answer l. 365 15 0

If Deal Boards be bought at 18d. *per Piece* and sold again at 21d. what is that *per Cent.* Profit?

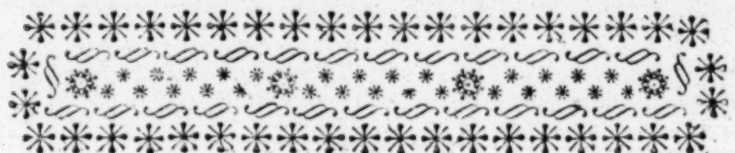
Answer l. 16 13 4, thus:

If 18d.——gain——3d.——what——100l.

If I buy Cinnamon for 6s. 7d *per lb.* and sell it again for 5s. 9d. what is lost *per Cent* ? Answer. l. 12-15-17.

If 6s. 7d.——lose——10d.——what——100l.

There are two or three other Rules, which might be introduced, such as *Allegation Medial* and *Alternate*, and the *Rule of False*; but they being more for Amusement than real Use, I shall omit them; and in the next Place, say something of *Fractions*.



CHAP XIX.

OF FRACTIONS, Vulgar and Decimal.

NUMERATION.

I. **A** Fraction is Part of a whole Number, and arises from *Division*, (as was said before) and hath these two Parts, viz. *Numerator* and *Denominator*, which have a short Line between them, and set thus;

Remainder 5 Numerator.

—
Divisor 8 Denominator.

The Numerator expresses the Number of Parts, and the Denominator giveth to those Parts their Names. As suppose 277l. be divided among 8 Men, the Quotient will be 34l. the Share to each Man; and there will be a Remainder of 5; which must be set over the *Divisor* 8, thus, $\frac{5}{8}$, and signifies, that if a l. or 20s. were divided into 8 Parts, each Man must have .5 of those 8 Parts (or $\frac{1}{2}$ Crowns) more to his Share, as was before hinted.

II. A Vulgar Fraction is either *Simple* or *Compound*.

III. A Simple Vulgar Fraction is that which hath only one Numerator, and one Denominator, and is either Proper or Improper.

IV. A Proper Fraction hath always its Denominator greater than its Numerator, as $\frac{3}{4}$, $\frac{7}{8}$, $\frac{12}{10}$, &c.

V. An Improper Fraction hath its Numerator always greater than its Denominator, as $\frac{5}{4}$, $\frac{9}{4}$, $\frac{10}{2}$, &c.

VI. Compound Fractions consist of divers Numerators and Denominators, and are known by this Particle [*of*] being between them; and are therefore sometimes called Fractions

Fractions of Fractions, as $\frac{2}{3}$ of $\frac{5}{6}$ of $\frac{7}{8}$, that is, two thirds of five sixths of seven eights,

VII. Fractions are of two Kinds, *Vulgar* and *Decimal*.

What *Vulgar* Fractions are, hath been declared already. A *Decimal* Fraction is an artificial Way of expressing *Vulgar* Fractions by setting down the Numerators only, the Denominators being understood, but not expressed, and is always an Unit, with as many Cyphers annexed as there are Places in the Numerator; and therefore must be either 10, 100, 1000, 10000, 100000, &c.

VIII. A *Decimal* Fraction is distinguished from a whole Number by a Comma, or Point prefixed thus, .5 and signifies 5 tenths of an Integer: So the following Fractions are exhibited vulgarly and decimally, viz,

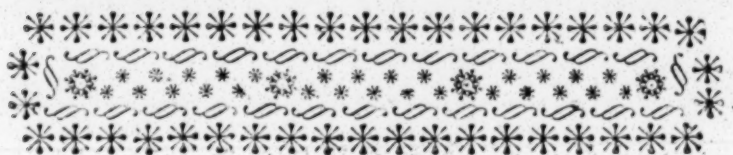
7 Tenths,	}	$\frac{7}{10}$	.7
35 Hundredths,		$\frac{35}{100}$	.35
327 Thousandths,		$\frac{327}{1000}$	.327
64 Ten Thousandths,		$\frac{64}{10000}$	.0064
108 Hundred Thouf.		$\frac{108}{100000}$	.00108

In Decimals $\frac{1}{4}$ of any thing is .25; $\frac{1}{2}$ of ditto, is, .5; $\frac{3}{4}$ is, .75.

IX. As whole Numbers increase by a Ten-fold Proportion from the Unit's Place to the left Hand, so Decimals decrease by the same Proportion, from Unity to the right Hand, as may be seen by the following Table.

N 6.

Integers.



CHAP XIX.

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N 6.

Integers,

Integers.						1	Decimals.						
<i>Millions</i>							<i>Millions of Parts</i>						
<i>C. of Thousands</i>							<i>C. of Thousands</i>						
<i>X's of Thousands</i>							<i>X Thousands</i>						
<i>Thousands</i>							<i>Thousands</i>						
<i>Hundreds</i>							<i>Hundredths</i>						
<i>Tens</i>							<i>Tenth Parts</i>						
7	6	5	4	3	2	1	2	3	4	5	6	7	
						Units.							
<i>Seventh Place</i>							<i>Primes</i>						
<i>Sixth Place</i>							<i>Seconds</i>						
<i>Fifth Place</i>							<i>Thirds</i>						
<i>Fourth Place</i>							<i>Fourths</i>						
<i>Third Place</i>							<i>Fifths</i>						
<i>Second Place</i>							<i>Sixths</i>						
Integers, or whole in-							Decimals, or Fractional						
creasing Numbers.							decreasing Numbers.						

Here the Figure 2 in the Integers signifies 2 Tens, or twice 10 Units; but the Figure 2 in the Decimals signifies but 2, or 2 Tenths of Unity, or one.

X The Order of Places in whole Numbers is from the right Hand to the left; but in Decimals it is from the left Hand to the right. So in the Decimal, ,456, the Figure 4 stands in the first Place, and is 4 Primes or 4 Tenths of an Integer; and 5, the second Figure is 5 Seconds, or Five Hundred Parts of an Integer, &c.

XI. Cyphers before Integers, and after Decimals, are of no Value, but after Integers, and before Decimals, they have their Value: For, in Integers they increase, and in Decimals they decrease the Value of the Figure join'd with them. For 4, and 04, and 004, in whole Numbers, is still but four; but in Decimals, 4 by having a Point prefixed, thus, ,4 is decreased from 4 Integers to $\frac{4}{10}$ of an Integer, and ,04 to 4 Hundredth Parts of an Integer, &c. Again, in whole Numbers, ,30 is Thirty, and 300 is Three hundred; but in Decimals, 30 or ,300 is still but $\frac{3}{10}$ of an Integer.

Reduction

Reduction of Fractions, is to bring a Fraction into a common, or into the least Denomination; thereby preparing Fractions to be added, subtracted, multiplied, or divided.

XII. To reduce Fractions that have unequal Denominators, to Fractions of one common Denominator.

The Rule.

Multiply each Numerator into all the Denominators, (except its own) and take the respective Products for new Numerators. 2dly, Multiply all the Denominators continually; so shall that Product be a new Denominator, common to all the Numerators found before.

Example.

Reduce $\frac{2}{7}$, $\frac{3}{7}$, and $\frac{8}{9}$ of a Pound, to a common Denominator.

The first 2 the 2d, 3 the third, 8 Denominator.

$\begin{array}{r} 7 \\ \hline 14 \\ 9 \\ \hline 126 \\ 315 \end{array}$	$\begin{array}{r} 5 \\ \hline 15 \\ 9 \\ \hline 135 \\ 315 \end{array}$	$\begin{array}{r} 7 \quad 5 \\ \hline 56 \quad 7 \\ 5 \quad 35 \\ \hline 280 \quad 9 \\ 315 \end{array}$	315 Com. Denominator
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Here I first multiply 2 by 7, and the Product is 14, which I multiply by 9, and the Result is 126, for the first Numerator. Again, I multiply 3 by 5, and the Product is 15, which multiplied by 9, makes 135, for the second Numerator: Then I multiply 8 by 7, and the Product is 56, which multiplied by 5, produces 280, for the last Numerator. Last of all, I multiply 5, 7, and 9, the several Denominators together, and their Product is 315 for the common Denominator to all the Fractions. *See the Work above:*

Reduce

Reduce $\frac{1}{2}$, and $\frac{5}{8}$ ——— $\frac{8}{16}$ ——— $\frac{10}{16}$ } Facit.
 Reduce $\frac{7}{11}$, and $\frac{1}{2}$ ——— $\frac{7}{22}$ ——— $\frac{12}{22}$ }
 Reduce $\frac{3}{7}$, and $\frac{5}{9}$ ——— $\frac{5}{33}$ ——— $\frac{35}{33}$ }

To prove your Work, divide the new Numerator by the Numerator of the Fraction; and also divide the common Denominator by the Denominator of the Fraction, and if both Quotients are alike, the Work is right.

XIII. *Abbreviation*, or how to bring a Fraction into its lowest Denomination.

The Rule.

Divide both Numerator and Denominator by such a Number as will leave no Remainder in either of them. When the Numerator and Denominator are both even Numbers, they may be reduced by halving, or dividing them by 2.

Example. Reduce $\frac{12}{28}$ into its lowest Terms, or Denomination.

$$2 \left\{ \begin{array}{c|c|c} 12 & 6 & 3 \\ \hline 28 & 14 & 7 \end{array} \right. \text{ Answer } \frac{3}{7}$$

Here I say, the $\frac{1}{2}$ of 12 is 6, and the $\frac{1}{2}$ of 28 is 14, and then again the $\frac{1}{2}$ of 6 is 3, and the $\frac{1}{2}$ of 14 is 7: So is the Fraction $\frac{12}{28}$ reduced to $\frac{3}{7}$ its lowest Terms; and $\frac{3}{7}$ of any thing is equal in Vaule to $\frac{12}{28}$. Or if you had divided the said Fraction by 4, it had been reduced at once; for the 4's in 12, 3 times, and the 4's in 28, 7 times, or $\frac{3}{7}$, as before.

When you can no longer halve the Fraction, then divide it either by 3, 4, 5, 6, 7, &c. if any of them so divide as to leave no Remainder. And after you have divided by a greater, you may after divide by a lesser Number, to reduce the Fraction lower still.

Example.

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Example. Reduce $\frac{54}{168}$ into its lowest Denomination.

$$\frac{1}{2} \left\{ \begin{array}{c} \text{by} \quad \text{by} \quad \text{by} \\ 84 \mid 2 \mid 42 \mid 7 \mid 21 \mid 3 \mid 3 \mid 1 \\ \hline 168 \mid 2 \mid 84 \mid 7 \mid 42 \mid 3 \mid 6 \mid 2 \end{array} \right\} \text{Answ. } \frac{1}{2}.$$

Here I first take the $\frac{1}{2}$, or divide it by 2, and then by 7, and then by 3, and then by 3, again, which brings the Fractions into $\frac{1}{2}$, its lowest Terms.

(3.) If the Fraction, *viz.* Numerator and Denominator, and each with a Figure of 5, or a Cypher, or the one with a 5, and the other with a Cypher, divide each of them by 5, and the Quotient will be a new Numerator and Denominator.

Example. Reduce $\frac{55}{80}$, and $\frac{75}{95}$, to their lowest Terms.

$$5 \left\{ \begin{array}{c} 55 \mid \frac{11}{16} \\ \hline 80 \mid 16 \end{array} \right\} \text{Answ. } \frac{11}{16}$$

$$5 \left\{ \begin{array}{c} 75 \mid \frac{15}{19} \\ \hline 95 \mid 19 \end{array} \right\} \text{Answ. } \frac{15}{19}$$

(4) There is a Way of reducing a Fraction into its lowest Name by a common Measure, which is thus :

Divide the Denominator by the Numerator, and if any thing yet remains, divide the foregoing or last Divisor by it; and so you must do till nothing remains, and then the last Divisor is the common Measure required, which will divide both Numerator and Denominator, without leaving any Remainder; and so reduce the Fraction into its lowest Terms at once. But if your last Divisor be 1, the Fraction is in its lowest Name already.

Example.

Example. Reduce $\frac{128}{144}$ into its lowest Terms by a common Measure.

$$\begin{array}{r} 128 \overline{)144} (1 \\ 128 \\ \hline \end{array}$$

$$\begin{array}{r} 16 \overline{)128} (8 \\ 128 \\ \hline \end{array}$$

(0)

$$\begin{array}{r} 16 \overline{)128} (8 \\ 128 \\ \hline \end{array}$$

(0)

$$16 \overline{)144}$$

144 (9

(0)

Here I first divide 144 by 128, and there remains 16; by which I divide the last Divisor 128 and there remains (0), wherefore 16 the last Divisor, is the common Measure sought for, and divides both Numerator and Denominator, without leaving any Remainder, (as may be seen in the Work above) and reduces the Fraction into $\frac{8}{9}$, its lowest Terms.

But I prefer the other Way, in common Business, before this latter; for the Time spent in finding the common Measure, is longer than that spent in reducing the Fraction the other Way.

It is very expeditious in many Cases to work Fractionally, viz. to multiply by the Numerator, and divide by the Denominator of a Fraction into its lowest Terms.

Example. What comes a hundred Weight to at $6d. \frac{1}{2}$ per Pound? Consider that $\frac{1 \frac{1}{2}}{2}$ in its lowest Terms, is $\frac{3}{4}$, wherefore multiply $6d. \frac{1}{2}$ by 3, and divide by 4 thus :

$$\begin{array}{r} 6d. \frac{1}{2} \\ 7 \\ \hline \end{array}$$

$$3 \overline{)45} \frac{1}{2} \text{ Rem. } \frac{2}{3}, \text{ or } 8d.$$

$$5 \overline{)15}$$

Ans $l. 3-0-8$ per Cent.

C.

Or If you double the Price of a Pound, and multiply by 7 and by 8, as follows, you have the Answer.

$$\begin{array}{r}
 6d. \frac{1}{2} \\
 \hline
 s. \quad 1-1 \\
 \hline
 7-7 \\
 8 \\
 \hline
 \text{Ans. } 3-0-8
 \end{array}$$

Or contrariwise, you have the Price of a Pound thus:
 $7)60s. 8d.$

$$\begin{array}{r}
 8) \quad 8 \quad 8 \\
 2) \quad 1 \quad 1 \\
 \hline
 6d. \frac{1}{2} \text{ Answer.}
 \end{array}$$

Any Goods sold by the Long Hundred, in Tale or 120 to the Hundred, as Linnen, Fish Deals, &c. being $\frac{120}{144}$ multiply the Price of one by 6, and divide that Product by 12, thus:

Example. Fish at $3d. \frac{1}{2}$ a Piece

$$\begin{array}{r}
 6 \\
 \hline
 12)21 \\
 \hline
 l. 1 \frac{9}{12} \text{ or } 15s.
 \end{array}$$

When Things are sold by the 1000, as Bricks, Tiles, Hoops, &c. standing Thus, $\frac{1000}{1200}$, then multiply the Price of one by 50, and divide by 12, it gives the Price of 1000.

Example.

Example. Oranges at 2d. a piece.

$$\begin{array}{r} 50 \\ \hline 12 \overline{)100} \end{array}$$

Answ. l. 8 $\frac{4}{12}$ or 6s. 8d. per Thousand

$$\begin{array}{r} 12 \overline{)50} 100 \quad 0 \quad 0 \quad \left. \vphantom{\begin{array}{r} 12 \overline{)50} 100} \right\} \text{contrary} \\ \hline 2d. \text{ a Piece.} \end{array}$$

Or any thing sold by the 1000 may be done by multiplying the Quantity by the Price, always cutting off 3 Figures, or Cyphers, toward the right Hnd.

Example. Bought 4796 plain Tiles, at 17s. 6per M,

$$\begin{array}{r} 17 \\ \hline 6d. \text{ is } \frac{1}{2} \text{ of } 1s. \quad 81532 \\ 2398 \\ \hline 83 \overline{)930} \\ 12 \\ \hline 4 \overline{)311} 160. \end{array}$$

Answ. l. 4-3-11 $\frac{160}{1000}$

This is an easy and plain Method:

Again, Sold 45874 Grey Stock Bricks, at 18s. per M.

$$\begin{array}{r} 18 \\ \hline 82 \overline{)5,732} \\ 12 \\ \hline l. 41-5-8 \overline{)784} \\ 4 \\ \hline 3,136 \end{array}$$

I multiply by 18, and it produces 825s. and 732 cut off for 1000, and that multiplied by 12; gives 8d. &c.

Answ. l. 41-5-8 $\frac{136}{1000}$

A Fraction is seldom abbreviated in Decimals.

XIV. Valuation. The Value of a Fraction is found by multiplying the Integer by the Numerator of the Fraction, and dividing that Product by the Denominator. Or contrary-wise, by dividing by the Denominator, and multiplying by the Numerator.

Example. What is the $\frac{2}{3}$ of a *l. Sterling*?

Contra, 3)20 20s. the Integer
2 Numerator

$$\begin{array}{r} \text{6 8} \\ 2 \end{array} \quad \begin{array}{r} 3)40 \\ \hline \end{array}$$

s. 13 4 Answer, s. 13 4 Answer.

What is the $\frac{4}{5}$ of a Pound?

$$\begin{array}{r} 20s. \\ 4 \\ \hline 5)80 \\ \hline 16 \end{array}$$

What is $\frac{1}{2}$ of $\frac{2}{3}$ of 20s.
3 its lowest Terms.

$$\begin{array}{r} 7)60 \\ \hline s. 8\frac{4}{7} \text{ Answer.} \end{array}$$

What is $\frac{3}{7}$ of a Hundred Weight?

Contra. 7)112 112lb. the Integer.

$$\begin{array}{r} \text{16} \\ 3. \end{array} \quad \begin{array}{r} 3 \\ \hline 7)336 \\ \hline \end{array}$$

48lb. Answer. 48lb. Answer.

What:

What is {	$\frac{6}{7}$ of a <i>l.</i> ?	Answ. 17. 1d. $\frac{1}{2}$ $\frac{1}{4}$
	$\frac{7}{8}$ of a Shilling?	Answ. 10d. $\frac{1}{2}$
	$\frac{8}{9}$ of a <i>l.</i> 100 <i>Sterling</i> ?	Answ. 75 <i>l.</i>
	$\frac{9}{10}$ of a Tun of Wine?	Answ. 176 $\frac{4}{10}$ Gal
	$\frac{10}{11}$ of a C. Weight?	Answ. 71 <i>l.</i> $\frac{1}{11}$
	$\frac{11}{12}$ of a Gallon?	Answ. $7\frac{1}{12}$ Pints.
	$\frac{12}{13}$ of a Tun Weight?	Answ. 15 C.
	$\frac{13}{14}$ of a Foot?	Answ. 8 Inches.
	$\frac{14}{15}$ of a <i>lb.</i> Weight?	Answ. 12 Oz.

*Mixt Numbers.*What is $\frac{4}{5}$ of 12*s.* 6*d.*?Contra. 6)12*s.* 6*d.*

$$\begin{array}{r}
 4 \\
 \hline
 6)50\ 0 \\
 \hline
 8\ 4
 \end{array}$$

$$\begin{array}{r}
 2\ 1 \\
 4 \\
 \hline
 8\ 4
 \end{array}$$

If a Yard of Cloth be worth 18*s.* 10*d.* what $\frac{1}{2}$?

$$\begin{array}{r}
 3 \\
 \hline
 4)26\ 6 \\
 \hline
 6\ 7\frac{1}{2} \text{ Answ.}
 \end{array}$$

If a Ship be worth *l.* 946 12 6, what $\frac{4}{12}$ Parts?

$$\begin{array}{r}
 8)3786\ 10\ 0 \\
 \hline
 4)473\ 06\ 3 \\
 \hline
 1.118\ 06\ 6\frac{3}{4}
 \end{array}$$

XV. If you would know what Part of a Pound any Number of Shillings and Pence is, or what Part of a Tun any

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any Quantity of *C. qrs.* and *lb.* is, bring them into the lowest Name mentioned ; and also bring the Integer into the same Name, and set it for a Denominator and then bring the Fraction into its lowest Terms.

Example. What Part of a Pound is 12s. 6d.

20s. the Integer

12

12

Numerator, 15105

Denominator, 24013

Anf.

When there are Cyphers in a Vulgar Fraction at the End, they may be cut off, and you work as if there were none, as in the foregoing Example:

What Part of *C. Weight* is 7 *lb.* $\frac{3}{4}$?

11

112 *lb.* the Integ.

11

784

1232

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Answer $\frac{784}{1232}$ or $\frac{7}{11}$, in its lowest Terms.

XVI. To reduce Vulgar Fractions into Decimals. Reduction of Decimals is either from common Fractions, or into some known Denomination. Therefore to reduce any Vulgar Fraction into a Decimal, to the Numerator of the Fraction, annex 1, 2, 3, 4, 5, or more Cyphers at pleasure, and then divide by the Denominator.

Example. Reduce $\frac{3}{4}$ of a *l.* into a Decimal Fraction,

4)300

,75 Facit, or 15s.

Here to the Numerator 3, I annex two Cyphers, and divide by the Denominator, and it quotes ,75 ; which is equal in Value to $\frac{3}{4}$ of any Thing.

If I had annexed 3 Cyphers to the Numerator, the Quotient would then have been ,750 which is still but ,75 ; for Cyphers on the right Hand do not increase or diminish a Decimal, as was said before.

Again,
Reduce

What is {	$\frac{6}{7}$ of a <i>l.</i> ?	Answ. 17. 1d. $\frac{1}{2}$ $\frac{6}{7}$
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$$\begin{array}{r} 4 \\ \hline 6)50 \ 0 \\ \hline 8 \ 4 \end{array}$$

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If a Yard of Cloth be worth 18s. 10d. what $\frac{1}{2}$?

$$\begin{array}{r} 3 \\ \hline 4)26 \ 6 \\ \hline 6 \ 7 \frac{1}{2} \text{ Answ.} \end{array}$$

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$$\begin{array}{r} 8)3786 \ 10 \ 0 \\ \hline 4)473 \ 06 \ 3 \\ \hline 1. \ 118 \ 06 \ 6 \frac{3}{4} \end{array}$$

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Denominator, 20 | 0 3

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Reduce

Reduce $\frac{2}{3}$ of a *l.* into a Decimal.

$$\begin{array}{r} 3 \overline{)2000} \\ \hline \end{array}$$

,666 Facit, or 13*s.* 4*d.*Reduce 6*s.* 8*d.* into a Decimal.

12

$$\begin{array}{r} 8 \overline{)0/2} \\ \hline \end{array}$$

$$\begin{array}{r} 24 \overline{)0/6} \\ \hline \end{array}$$

$$\begin{array}{r} 6 \overline{)2000} \\ \hline \end{array}$$

,333 Facit, or 6*s.* 8*d.*

XVII. Valuation of Decimals. In Money you must account for every Prime, or Unit, in the first Place, 2 Shillings; and for every 5 in the second Place, 1 Shilling; and what is above 5, account so many Tens; and the Figure in the third Place, so many Units; which Tens and Units are Farthings; but if they exceed, $\frac{25}{8}$ there must be one Farthing abated.

Example. What is the Value of .75*l.* the first of the foregoing Examples? Answ. 15*s.* For the 7 in the first Place, I reckon 14*s.* and for five in the second I account 1*s.* which put together, make 15*s.* the Value of the Decimal Fraction.

Again. Another *Example* is, .333: For the first 3 I reckon 6*s.* and for the other two I account 33 Farthings, and abating 1, (because above 25) there refts 32, or 8*d.*

What is the Value of .9749? The first Figure 9, being doubled, makes 18*s.* and the Figure (7) in the second being above 5, I reckon 1*s.* which put to the 18, makes 19*s.* and the Excess of 7 above 5 being 2, or 2 Tens, makes the next Figure 4 to be 24, which is 24 Farthings, or six Pence. So the Decimal Fraction, .9749 is in Value 19*s.* 6*d.* *A decisive Rule.* As often above 13 makes less by 1, or above 39 makes less by 2.

When you would know the Value of a Decimal in Weight, Measure, &c. (as the Value of Decimals of Money may be also found) multiply the Decimal by the Part of the next inferior Denomination, which make an Integer

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in the same Denomination with the given Decimal; and cut off so many Figures towards the left Hand, as there are Places in the Decimal, and the Figures on the other Side of the Stroke towards the left Hand, are the Value of the Decimal, in the next inferior Denomination. And if there be any thing remaining, multiply it by the Parts of the next lower Denomination &c. And so the Fraction may be reduced as you please.

Example. What is the Value of this Decimal of a C, Weight, viz. ,875 Answer $\frac{3}{4}$ 14 lb.
4 qrs. 1 G.

3|500
28 lb. 1 qr.

4000
1000

14|000

Here three Places are cut off towards the left Hand; because there are so many in the Decimal. And thus may the Value of any Decimal be found, whether of Money, Weight, Measure, Time, &c.

XIX. To reduce compound Fractions into simple ones of the same Value.

Rule. Multiply all the Numerators continually for a Numerator, and all the Denominators for a Denominator.

Ex. Reduce $\frac{3}{4}$ of $\frac{5}{6}$ of $\frac{7}{8}$ of a *l.* into a simple Fraction.

3
5
—
15
7
—

4
6
—
24
8
—

Numerator 105
Denomiator. 192 Facit.

192 Denominator.

Reduce $\frac{2}{10}$ of $\frac{1}{12}$ of $\frac{1}{14}$ of a Tun $\frac{1}{1050}$.

XX.

XX. To Reduce whole or mixt Numbers into improper Fractions. *Rule.*

(1) If a whole Number is to be reduced into an improper Fraction, let the propos'd whole Number for the Numerator, and an Unit. or 1, the Denominator: Thus 8 Integers may be reduced to $\frac{8}{1}$; or else you may assign a Denominator to the Integer, and multiply it by the assigned Denominator, and the Product will be the Numerator to the said Denominator

Example. Admit 9 Integers are to be reduced into an improper Fraction whose Denominator shall be 5: Here I multiply 9 by 5, the propos'd Denominator, and the Product is 45, for a Numerator to the said Denominator 5; so is the improper Fraction $\frac{45}{5}$ equal to 9 Integers.

Reduce 24 into an improper Fraction, whose Denominator shall be 8.

$$\begin{array}{r} 24 \\ 8 \\ \hline 192 \end{array} \left. \vphantom{\begin{array}{r} 24 \\ 8 \\ \hline 192 \end{array}} \right\} \text{Facit}$$

(2) If a mixt Number is to be reduced into an improper Fraction. *Rule.*

Multiply the whole Number by the Denominator of the Fraction, and take in the Numerator.

Ex. Reduce $12\frac{3}{4}$ into an improper Fraction.

$$\begin{array}{r} 4 \\ \hline 51 \end{array} \left. \vphantom{\begin{array}{r} 4 \\ \hline 51 \end{array}} \right\} \text{Facit. equal to } 12\frac{3}{4}$$

Again, Reduce $1. 14\frac{7}{8}$, or $1. 14-17-6$ into an improper Fraction.

$$\begin{array}{r} 8 \\ \hline 119 \end{array} \left. \vphantom{\begin{array}{r} 8 \\ \hline 119 \end{array}} \right\} \text{Facit,}$$

XXI. To reduce improper Fractions into whole or mixt Numbers. *Rule.*

Divide the Numerator by the Denominator, and if it be a mixt Number, what was taken in will remain.

Example. Reduce $11\frac{2}{3}$ (the fore going Sum) into its equivalent mixt Number.

$$\begin{array}{r} 8 \overline{)119} \\ 14\frac{7}{8} \text{ Answ. Or l. } 14 \cdot 17 \cdot 6. \end{array}$$

Here the Answer is 14 Integers, and of an Integer Reduce $5\frac{1}{4}$ Yards into a mixt Number.

$$\begin{array}{r} 4 \overline{)51} \\ 12\frac{3}{4} \text{ Yards Answer.} \end{array}$$

Reduce $4\frac{5}{5}$ into its equivalent whole Number,

$$\begin{array}{r} 5 \overline{)45} \\ 9 \text{ Anf. } 9 \text{ Integers} \end{array}$$

XXII. To reduce Fractions from one Denominator to another.

(1) This is either a smaller Fraction to be brought into the Denomination of a greater. Or,

(2) A greater into that of a smaller.

Examples. Reduce $3d. \frac{1}{2}$ into the Fraction of a *l.* *Sterling.* Make of it a compound Fraction, thus. Reduce the mixt Number into an improper Fraction, thus, $3d. \frac{1}{2}$, then say what is $\frac{7}{2}$ of $\frac{1}{12}$ of $\frac{1}{20}$ of a *l.*

Answ. $\frac{7}{480}$. Or you may say, what is $\frac{7}{2}$ of $\frac{1}{240}$?

Answ. $\frac{7}{480}$.

Here it being reduced from a Compound Fraction to a simple one, according to the 19th Rule of this Chapter, it produces $\frac{7}{480}$, the proper Fraction of a *l.* belonging to $3d. \frac{1}{2}$.

Reduce $\frac{3}{4}$ of a Penny to the proper Fraction of a *l*.

Say $\frac{3}{4}$ of $\frac{1}{12}$ of $\frac{1}{20}$, or $\frac{3}{4}$ of $\frac{1}{240}$. Answ. $\frac{3}{960}$.

By the same Method may be reduced either Weight or Measure, &c.

When the Fraction is to be brought from a greater to a lesser Name, then multiply the Numerator by the Parts in the several Denominations, betwixt that and it, that you would reduce it to.

As suppose the Reverse of the last Question was ask'd, viz

What Part of a Penny is the $\frac{3}{960}$ of a *l*.

$$\begin{array}{r} 3 \\ 20 \\ \hline \end{array}$$

$$\begin{array}{r} 60 \\ 12 \\ \hline \end{array}$$

$$\begin{array}{r} 720 \\ 4 \quad 2880 \\ \hline 2880 \quad 3 \end{array} \left. \vphantom{\begin{array}{r} 720 \\ 4 \quad 2880 \\ \hline 2880 \quad 3 \end{array}} \right\} \text{Answer.}$$

$$\begin{array}{r} 3)2880 \\ \hline 960 \text{ Proof.} \end{array}$$

Again Reduce $\frac{3}{4}$ of *l*. to the Fraction of a Penny.

$$\begin{array}{r} 3 \\ 20 \\ \hline \end{array}$$

$$\begin{array}{r} 60 \\ 12 \\ \hline \end{array}$$

$$\begin{array}{r} 720 \\ \hline 3 \end{array} \left. \vphantom{\begin{array}{r} 720 \\ \hline 3 \end{array}} \right\} \text{Facit.}$$

Addition of Fractions.

If the Fractions to be added have a common Denominator, then add all the Numerators together for a Numerator, and Place it over the common Denominator.

Example

Example. What is the Sum of $\frac{2}{5}$, $\frac{3}{5}$, and $\frac{4}{5}$ of a *l.*?

$$\begin{array}{r} 2 \\ 3 \\ 4 \\ \hline 9 \\ \hline 5 \end{array}$$

This being an improper Fraction, I reduce it to a mixt Number, and it makes $1\frac{4}{5}$, of *l.* 1-16.

Or thus :	Decimally.			} is	Demonstration.			
$\frac{2}{5}$	,4	$\frac{2}{5}$	,40		$\frac{2}{5}$	o	8	o
$\frac{3}{5}$	,6	$\frac{3}{5}$	,60		$\frac{3}{5}$	o	12	o
$\frac{4}{5}$	,8	$\frac{4}{5}$	,80		$\frac{4}{5}$	o	16	o
<i>l.</i> 1,8	1,80, or <i>l.</i> 1-16				<i>l.</i> 1	16	o <i>Proof.</i>	

Here the Vulgar Fraction being reduced to Decimals, according to the 16th Rule of this Chapter, I cast up the Respective Decimals, as I do whole Numbers, and the Answer is 1 Integer, and ,8 of an Integer; that is *l.* 1-16 the 8 Primes being accounted 16s. according to the Rule of Valuation of Decimals, given in the 17th Rule of this Chapter.

In *Addition of Decimals*, we observe the same Method as in whole Numbers, only in setting down, Regard must be had that the fractional Parts stand one under the other, *viz.* Primes (or Tenths) under Primes; Seconds under Seconds; Thirds under Thirds, &c. And if mixt Numbers are to be added then the Fractions to stand as before directed, and the whole Numbers to stand as in whole Numbers; that is, Units under Units; Tens under Tens, &c, without any Regard to the Fractions annexed.

Examples.

Fractions.		Mixt Numbers.
.45	.4	124.97
.5	.574	7.065
.095	.0067	27.5
.225	.56	65.007
1.270	1.5407	224.542

Note, That so many fractional Places as are found in the greatest among those Numbers that are added, so many Places must be pointed off from the Total, towards the right Hand, for Decimal Parts, and the other Figures towards the left Hand, are whole Numbers, as in the foregoing Example may be observed.

Again Add 4 Feet 3 Inches, 6 Feet 9 Inches, and 3 Feet 9 Inches together.

Feet. Pts.
4, 25
6, 75
8, 50
19, 50
Answer. 19 Feet $\frac{5}{8}$.

More Examples.

Integer Parts.	Decimal Parts of a	l.	s.	d.
41, 426	.333	} or {	6	8
16, 04	.25		5	0
36, 274	.75		15	0
22, 8	.033		0	$0\frac{1}{4}$
	.3		6	0
116, 540				
			1	12
				$8\frac{1}{4}$

SUB.

SUBTRACTION.

I. As in *Addition*, if the Fractions have unequal Denominators, they must be reduced to a common Denominator before *Subtraction* can be made. Then subtract one Numerator from the other, and place the Difference over the common Denominator.

From $\frac{7}{8}$ of a *l.* take $\frac{2}{3}$

Decimally

,875

,666

,209

Answ. 4s. 2d.---

7 2 8
3 8 3

21 16 24

16

5

24

Answ. 4s. 2d.

From $\frac{7}{8}$ take $\frac{2}{3}$.

Answer $\frac{1}{4}$ or $\frac{1}{4}$

Decimally,

,875

,666

Answ. ,500

From $\frac{11}{16}$ *l.* take $\frac{1}{2}$

16

8

11

8

3

16

Anf. 3s. 9d.

Subtraction of Decimals is the same as in whole Numbers, observing to keep the same Order of Placing the Numbers as directed in *Addition of Decimals*.

II. To subtract a Fraction from a whole Number.

Rule. Subtract the Numerator of the Fraction from the Denominator, and the Remainder place over the given Denominator, for a Numerator; and take a Unit from the

0 3

the

the whole Number of what you borrowed, and the Remainder place before the Fraction found; which mixt Number shall be the Difference sought.

Example. Subtract $\frac{2}{8}$ from 25, Facit $24\frac{3}{8}$.

Here 6 from 8 and there rests 2, which I put over the Denominator 8, thus $\frac{2}{8}$; then 1 from 25 and there rest 24, which I place before the Fraction $\frac{2}{8}$, thus, $24\frac{2}{8}$; which is the Difference sought.

From 12 Ells take $\frac{5}{8}$, Facit $11\frac{3}{8}$.

Decimally. From .6875 take .5 of a *l*.

.5000

.1875 Answ. or 3*s*. 9*d*.

Here the Vacancy is supplied with Cyphers, or they might have been omitted, and only supposed to have been there; and if at any time there should be a Vacancy in the upper Number, it may be supplied with Cyphers; or, as abovesaid, accounted there.

Example. Subtract this Decimal of a *l*, viz. .75 from this whole Number, 25*l*.

25.00

.75

24.25 or *l*. 24*s*. 5*d*.

Here the Defect, (tho' not of Places, yet of Number) is supplied by annexing Cyphers to the whole Number; for otherwise you could not subtract .75 from 25.

III. To subtract a mixt Number from a whole Number.

Rule. From the Denominator of the Fraction, subtract the Numerator, and set the Remainder over the Denominator, and then pay 1 to the whole Number, and subtract it from the Integer, and the Remainder is the true Difference sought.

Example

Example. From 12s. take $5\frac{3}{8}$

$5\frac{3}{8}$

Decimally.

12s. . . .

Facit $6\frac{5}{8}$ or 6s. 7d. $\frac{1}{2}$ 5.375

Ans. 6.625 or 6s. 7d. $\frac{1}{2}$.

Again. From 24 Ells take 19 Ells $\frac{3}{4}$.
Decimally. $19\frac{3}{4}$

24

19.6

$4\frac{1}{4}$

4.4 Ans.

From 16C take C. $13\frac{7}{10}$

$13\frac{7}{10}$

Decimally.

16

13.4375

$2\frac{3}{10}$ Ans.

2.5625

IV. To subtract a mixt Number from a mixt Number.

Rule. (1.) Take the lesser Numerator from the greater.

Example. From $37\frac{7}{8}$ take $23\frac{5}{8}$.

Decimally.

$23\frac{5}{8}$

37.875

23.625

$14\frac{2}{8}$ Ans.

14.250

(2.) When a greater Fraction is to be taken from a lesser, then take the Numerator of the greater Fraction from its Denominator, and put the Remainder to the Numerator of the lesser, which is borrowing an Integer, &c.

Example. Take C. $24\frac{12}{10}$ from $35\frac{7}{10}$

C. $35\frac{7}{10}$

$24\frac{12}{10}$

Facit, $10\frac{11}{10}$

From

From *Gal.* $78\frac{1}{2}$ take *Gal.* $29\frac{1}{2}$. Reduce to a common Denominator.

The Fractions $\frac{1}{2}$ and $\frac{1}{2}$ then from $78\frac{1}{2}$
take $28\frac{1}{2}$

Facit, $49\frac{1}{2}$

M U L T I P L I C A T I O N.

Rule. 1. First multiply the Numerators together for a new Numerator; and secondly, multiply the Denominators together for a new Denominator.

Example. Multiply $l. \frac{7}{3}$ by $\frac{1}{3}$ of a $l.$

Here 7 times 3 is 21, the Numerator, 21 } Facit,
— } or
And 3 times 4 is 32, the Denominator, 32 } $13--1\frac{1}{2}$

Multiplication in whole Numbers increases the Product, but in Fractions it decreases it, that is, makes it less than either of the two Numbers alone.

The Reason is, because 1 multiplied by 1 is but 1; therefore that which is less than one, being multiplied by that which is less than 1, must needs be lessened by *Multiplication*.

In *Multiplication of Decimals*, we proceed as in whole Numbers, only when you have done your Multiplication, you must point off from the Product as many Figures, or Cyphers towards the right Hand, as there are fractional Places in both Multiplicand and Multiplier; and what Figures remain toward the left Hand, beside what are cut off, are Integers: But if there are not so many Places, such Defect must be supplied by Cyphers towards the left Hand.

Example. Multiply the foregoing Sum, viz. $\frac{7}{3}$ by $\frac{1}{3}$ Decimally.

Here

$$\begin{array}{r} \frac{7}{8} \text{ } ,875 \\ \frac{3}{4} \text{ } ,75 \\ \hline \end{array}$$

Here are 5 decimal Places in both the Fractions, therefore all the Product is pointed off for decimal Parts,

$$\begin{array}{r} 4375 \\ 6125 \\ \hline \end{array}$$

65625 Answer 13s. 1d.

II. When a compound Fraction is to be multiplied by a simple one, according to the 19th Rule in *Reduction of Fractions*, and work as before.

Example Multiply $\frac{3}{8}$ of a *l.* by $\frac{5}{8}$ of $\frac{3}{4}$ of a *l.* The compound Fraction being reduced, makes $\frac{15}{32}$ which multiplied by $\frac{3}{8}$, produces $\frac{45}{256}$, or 3s. 6d.

When a Fraction or mixt Number, is to be multiplied by a whole Number, constitute a Unite for a Denominator to the whole Number, and then it becomes an improper Fraction; then work as before.

Example Multiply 24 by $\frac{2}{3}$ (that is $2\frac{4}{3}$ by $\frac{2}{3}$) Facit $4\frac{8}{3}$ Multiply *l.* 12 by $\frac{3}{8}$ of a *l.*

$1\frac{2}{3}$ per $\frac{3}{8}$ Answer $3\frac{6}{8}$ or 4*l.* 10s.

Decimally.

$$\begin{array}{r} ,375 \\ ,12 \\ \hline \end{array}$$

Facit, 4,500 or 4*l.* 10s.

III. When a mixt Number is to be multiplied by a Fraction, reduce the mixt Number into an improper Fraction, and work as before.

Example $16\frac{1}{2}$ by $1\frac{4}{2}$

2

33

2 per $1\frac{4}{2}$, Facit $1\frac{32}{2}$.

Multiply $7\frac{1}{2}$ by $\frac{3}{4}$ of a Yard. Facit $5\frac{7}{8}$, or $5\frac{7}{8}$ Yards.

Decimally.

$$\begin{array}{r} 7,25 \\ + 75 \\ \hline 3625 \\ 5057 \\ \hline 5,5375 \end{array}$$

IV. To multiply mixt Numbers by mixt Numbers; that is, a whole Number and a Fraction by a whole Number and a Fraction.

Rule. Reduce the given Numbers into improper Fractions, and work as before.

Example. Multiply $120\frac{1}{4}$ by $48\frac{1}{2}$

$$\begin{array}{r}
 4 \qquad \qquad 2 \quad 2 \\
 \hline
 481 \quad 481 \quad 97 \quad 8 \text{ Denom.} \\
 \hline
 \qquad 97 \quad \hline
 4 \quad \hline
 \hline
 3367 \quad \hline
 4329
 \end{array}$$

Denominator, $8)46657$

Anfwer $5832\frac{1}{8}$

Or thus: First multiply the whole Numbers together as 120 by 48; and the Product add $\frac{1}{4}$ of 48, and $\frac{1}{2}$ of 120.

Example.

Decimally.

$$\begin{array}{r} 120.25 \\ 48.5 \\ \hline 60125 \\ 96200 \\ 48100 \\ \hline 5832.125 \end{array}$$

120 $\frac{1}{4}$ long.
48 $\frac{1}{2}$ broad.

960
480
60 the $\frac{1}{2}$ of 120
12 the $\frac{1}{4}$ of 48

5832 $\frac{1}{8}$ Answ.

Then

Then multiply the Fractions by themselves, saying, once 1 is 1, and twice 4 is 8; which produces the $\frac{8}{4}$, as in the *Example*.

And thus, by either of these Ways, having the Length and Breadth of any superficial Quantity, its Contents may be found.

Multiply $2s. \frac{1}{2}$ by $3s. \frac{2}{4}$.

$$\begin{array}{r} 3 \frac{2}{4} \\ \hline 6 \\ 1 \\ 1 \end{array}$$

Facit. $8 \frac{2}{4}$, or $8s. 2d$.

Or thus (3)

$$\begin{array}{r} 2 \quad 4 \\ \quad 3 \quad 6 \\ \hline 7 \quad 0 \\ 1 \quad 2 \\ \hline 8 \quad 2 \end{array}$$

Or $2s. 4d$. by $3s. 6d$.

(2)

Or thus: $s. \quad d.$

$$\begin{array}{r} 2 \quad 4 \\ 3 \quad 6 \\ \hline 6 \quad 0 \\ 1 \quad 0 \\ 1 \quad 2 \end{array}$$

Answ. $8 \quad 2$

Decimally.

$$\begin{array}{r} 2.333 \\ 3.5 \\ \hline 11665 \\ 6999 \end{array}$$

8.1655 Anf, $8s. 2d$.

The second of these Ways is called *Cross Multiplication*, or *Duo Decimals*, by which Shillings and Pence may be multiplied by Shillings and Pence; or Feet and Inches by Feet and Inches, carrying the same from one Denomination to the next: for as 12 Pence make a Shilling, so does so many Inches a Foot. In the Work I first multiply the whole Numbers by themselves, saying, 3 times 2 is 6; then cross-ways, I say, 6 times 2 is 12d or 1s. and three times 4 is 12d. or 1s. Then the Pence by the Pence, saying 6 times 4 is 24, which I divide by 12, saying the 12's in 24, twice, &c.

O 6

But

Then

But the third and best Way is wrought *practically*, and the last *decimally*; each Method producing the same Answer; as may be seen in each Work.

	<i>l.</i>	<i>s.</i>	<i>d.</i>		<i>l.</i>	<i>s.</i>	<i>d.</i>
Multiply	3	15	9		84	13	6
By		<i>l.</i> 4, 7, 6				<i>l.</i> 17, 3	
	15	3	0		338	13	0 p 4 & 4
2. 6d. $\frac{1}{8}$		9	$5\frac{1}{2}$				4
ditto		9	$5\frac{1}{2}$				
ditto		9	$5\frac{1}{2}$				
					1554	16	0
Facit <i>l.</i> 16	11	4	$\frac{1}{2}$		84	13	6
						8	9 4 $\frac{2}{10}$
						4	4 8 $\frac{1}{10}$
					<i>l.</i> 1452	3	6 $\frac{3}{10}$

By the same Method may be multiplied Weight or Measure.

D I V I S I O N.

I. If the Fractions are single, and have a common Denominator, divide the one Numerator by the other, and place the Quotient over the Denominator.

Examples.

Divide $\frac{6}{8}$ by $\frac{3}{8}$, Facit $\frac{2}{8}$.

Divide $\frac{9}{12}$ by $\frac{3}{12}$, Facit $\frac{3}{12}$.

Divide $\frac{27}{32}$ by $\frac{3}{32}$, Facit $\frac{9}{32}$.

II. *Division of Decimals* is worked just as it is in whole Numbers; only when the Work is over, you must point off as many Places from the Quotient, for Decimal Parts, as the Dividend has more than the Divisor; that is there must be as many Decimal Places in the Divisor and Quotient as there are in the Dividend; but if not, the

the defect must be supplied by Cyphers being annexed to the left hand of the Quotient, and is just the Converse of Multiplication of decimals.

III. When the Divisor consists of more Places than the Dividend, a competent Number of Cyphers must be annexed to the Dividend, before you can make a Division.

Example. Let us divide the first Sum on the other Side *Decimally*; when the Fractions are reduced to Decimals, they make ,75 to be divided by ,375, wherefore I join two Cyphers to the Dividend, 75, thus, ,7500, and then divide as in whole Numbers.

$$\begin{array}{r} .375 \overline{) .7500} (20 \text{ or } .2 \\ \underline{750} \\ (0) \end{array}$$

IV. When in Vulgar Fractions, the Dividend and Divisor are both simple Fractions, Then multiply the Numerator of the dividend by the Denominator of the Divisor, for a Numerator; and also multiply the Denominator of the Dividend into the Numerator of the Divisor, for a Denominator, and the Work is done.

Example.

What is the Quotient of $\frac{4}{5}$ of a *l.* divide by $\frac{3}{4}$ of a *l.*

$$\begin{array}{l} \frac{3}{4} \overline{) \frac{4}{5}} \text{ Answer} \\ \text{Divide } \frac{4}{5} \text{ by } \frac{3}{4}, \text{ Facit } \frac{16}{15}, \text{ or } \frac{7}{8} \end{array}$$

Or you may reduce the Fractions to a common Denominator, and then divide the new Numerator of the Dividend by the new Numerator of the Divisor

Example

Example.

Divide $\frac{12}{14}$ by $\frac{9}{12}, \frac{144}{108}, \frac{125}{100}$,

126)144($\frac{18}{7}$ Answ.

V. To divide a whole Number by a Fraction, multiply the Integer by the Denominator of the Fraction, and divide by the Numerator.

Example.

Divide 15 Yards by $\frac{3}{4}$ 15
Decimally. 4

575)15.00)20 or
150. 3)60(20 Answer.

(0)

VI. To divide a Fraction by a whole Number, let the Numerator stand as Numerator, and multiply the Integer into the Denominator for a Denominator.

Example.

Divide $\frac{2}{3}$ of an Ell by 9 Ells, Facit $\frac{2}{11}$.
Decimally.

9).400(

.44 Answer.

VII

VII. To divide a mixt Number by a whole Number, reduce the mixt Number into a improper Fraction; and by its Denominator multiply the Integer for a divisor.

Example,

Divide $5 \frac{3}{4}$ Yards by 4 Yards.

$$\begin{array}{r}
 4 \overline{) 23} \\
 \underline{20} \\
 3 \\
 4 \overline{) 30} \\
 \underline{28} \\
 2 \\
 4 \overline{) 20} \\
 \underline{20} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 4 \overline{) 23} \\
 \underline{16} \\
 7 \\
 4 \overline{) 28} \\
 \underline{28} \\
 0
 \end{array}$$

Decimally. $4 \overline{) 5.750}$

Facit, 1.437

VIII. To divide a mixt Number by a Fraction, reduce the mixt Number into an improper Fraction, and then multiply the Numerator of the improper Fraction, by the Denominator of the Fraction, and the Denominator of the improper Fraction by the Numerator.

Example,

Divide $12 \frac{2}{3}$ by $\frac{5}{8}$

$$\begin{array}{r}
 3 \overline{) 38} \\
 \underline{30} \\
 8 \\
 3 \overline{) 24} \\
 \underline{24} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 38 \overline{) 304} \\
 \underline{304} \\
 0
 \end{array}$$

Decimally. $15 \overline{) 12.666003}$

Answer. $20 \frac{4}{15}$

Answer. 20.265

IX. To divide a whole Number by a mixt Number, reduce the mixt and whole Numbers into improper Fractions, and work as before,

Example,

Example.

$\begin{array}{r} 48 \\ 2 \overline{) 96} 48 \frac{1}{2} \text{ Answer.} \\ 75 \\ \hline 21 \end{array}$	Divide l. 48 by l. $12 \frac{1}{2}$ $\begin{array}{r} 2 \\ 1 \overline{) 25} \\ \hline 2 \end{array}$ Decimally $12,5 \overline{) 48,000} 3,84 \text{ Answer.}$
--	---

X. To divide a mixt Number by a mixt Number, bring them into proper Fractions, and work as before

Example.

Decimally. $\begin{array}{r} 5,5 \overline{) 8,750} 1,59 \\ 55 \\ \hline 325 \\ 275 \\ \hline 500 \\ 495 \\ \hline (5) \end{array}$	Divide $8 \frac{1}{2}$ Yards by $5 \frac{1}{2}$ Yards $\begin{array}{r} 4 \quad 2 \\ \hline 35 \quad 11 \\ \hline 4 \quad 2 \\ \hline \end{array}$ $44 \overline{) 70} 1 \frac{26}{44}$ $\begin{array}{r} 44 \\ \hline 26 \end{array}$
--	--

The RULE of THREE

Here, as in whole Numbers, the first and third Numbers must be of one Denomination; and as is the Stating, so is the Operation the same, *viz.* second and third Numbers are multiplied together, and that Product divided by the first; according to the foregoing Rules of working Fractions.

Example

Example

If $\frac{3}{4}$ Yard of Cloth cost $\frac{4}{5}$ of a *l.* what $\frac{5}{6}$ Yard.

$$\frac{4}{20}$$

$$\frac{5}{30}$$

2)30(59

Ans^r. $\frac{8}{5}$ or 17s. 9d. $\frac{1}{3}$

When the Numerator and Denominator both terminate with a Cypher, or Cyphers, they may be cut off, and the Fractions still retain the same Value.

There is another and better Way of working the Question, when it is stated, which is thus;

Multiply the Numerators of the first, into the Denominators of the second and third Fractions, for a new Denominator ; and then the Denominator of the first Fraction into the Numerators of the second and third, for a new Numerator ; which if an improper Fraction, may be reduced into a whole or mixt Number.

Example.

If $\frac{3}{4}$ Yard cost $\frac{4}{5}$ £. what $\frac{5}{8}$ Yard. Answ. $\frac{80}{9}$, or $\frac{8}{9}$.

$$\begin{array}{r} 4 \\ \hline 16 \\ 5 \end{array}$$

$$\begin{array}{r} 3 \\ \hline 15 \\ 6 \end{array}$$

80

90

Facit $\frac{80}{90}$, or $\frac{8}{9}$ as before.

The foregoing Question wrought decimally.

<i>Yards.</i>	<i>l.</i>	<i>Yards</i>
1f,75	cost ,8	what ,833
		,8

75), 66640(, 888 Answ. or 17s. 9d.

16

lb. s. lb.
If $2\frac{1}{4}$ Tobacco cost $3\frac{1}{2}$ what $242\frac{1}{4}$

$\begin{array}{r} 4 \\ \hline 11 \\ \hline 4 \\ 7 \\ \hline 28 \\ 969 \\ \hline 252 \\ 168 \\ \hline 252 \\ \hline 27132 \end{array}$	$\begin{array}{r} 2 \\ \hline 7 \\ \hline 2 \\ 11 \\ \hline 22 \\ 4 \\ \hline 88 \end{array}$	$\begin{array}{r} 4 \\ \hline 969 \\ \hline 4 \\ \hline 88 \end{array}$
---	---	---

88 Denominator.

$$\left. \begin{array}{r} 252 \\ \hline 27132 \end{array} \right\} \text{Answ.}$$

27132 Numerator 88

$$88)27132(30\frac{3}{8}$$

15-8- $3\frac{3}{4}$ Facit.

Decimally.

$\begin{array}{r} lb. \\ \hline 2.75 \end{array}$	$\begin{array}{r} s. \\ \hline 3.5 \end{array}$	$\begin{array}{r} lb \\ \hline 242.25 \\ 35 \\ \hline 121125 \\ 72675 \\ \hline 2.75)847.875(30\frac{3}{8} \end{array}$
---	---	---

Answ. $l. 15-8-3\frac{3}{4}$

Here the Operation is just as it is in whole Numbers.

Before

Before I conclude, I shall work some Examples in Interest by decimals, by which may be seen, that the Decimal Way, in some Cases, has the Advantage of the Vulgar.

Simple Interest.

Example 1. What is the Amount of a Year's Interest of 826*l.* 13*s.* 9*d.* at 5 *per Cent.*

$$\begin{array}{r} 826,687 \\ ,05 \\ \hline \end{array}$$

Answ. 41,33435 *Or l.* 41 6 8 $\frac{1}{4}$ according to the Rule of valuing a Decimal in Reduction of Fractions.

Here the 13*s.* 9*d.* is reduced to the Decimal, ,687, and annexed to the whole Number, 826*l.* with the Decimal Characteristic between them; which multiplied by 05 the Decimal of the Rate, *viz* 5 *per Cent.* which is found by annexing Cyphers to the Rate and dividing by 100, thus:

per Cent.

100)5000(,05 according to the Way of valuing the Quotient in Division of Decimals, *viz.* the Quotient must have as many Decimal Places as the Dividend exceeds the Divisor. After the same Manner the Decimal for 4 *per Cent.* is found to be ,04, and of 6, ,06 &c.

Example

Example.

What is the Year's Interest of 348*l.* 13*s.* 2*d.*, at 6
per Cent. per Annum.

$$\begin{array}{r} \text{£. } 348,658 \\ \quad \quad \quad 06 \\ \hline 20,91948 \text{ Answer } \text{£. } 20-18 \text{ } 4\frac{1}{2}. \end{array}$$

Here there are as many decimal Places separated to the right Hand, as there are decimal Places in both Multiplicand and Multiplier, according to the Rule of Multiplication in Decimals (as in the foregoing Example also) and the Decimal Parts are found to be 18*s.* 4*d.* $\frac{1}{2}$, according to the Rule of valuing a Decimal of Money, &c.

Example 3.

$$\begin{array}{r} \text{What's the the Interest of} \\ \text{£. } 326 \text{ --- at --- } 4 \text{ per Cent.} \\ \quad \quad \quad ,04 \\ \hline 13,04 \text{ Answer } \text{£. } 13-00-9\frac{1}{2} \end{array}$$

When the Simple Interest of any Sum is required for 2, 3, 4, 5 Years, &c. its only to find the Interest for 1 Year, and then to multiply that Interest by 2, 3, 4, or 5, &c.

Example

Example 4.

What's the Interest of 324*l.* 10*s.* for 4 Years, at 4 per Cent, per Annum?

$$\begin{array}{r} 1. \\ 324.5 \\ .04 \\ \hline \end{array}$$

12,980 Answer for 1 Year *l.* 12 19 $7\frac{1}{2}$
Years 4

Answer *l.* 51 18 5

If the Interest required be for Parts of a Year, *i. e.* Months &c take such Parts of the Year's Interest; as 6 Months is the $\frac{1}{2}$, 3 Months the $\frac{1}{4}$, and 4 Months the $\frac{1}{3}$, &c.

To find the Interest of any Sum of Money, for any Number of Days, at any Rate of Interest.

Rule. Multiply the Principal by the Rate of Interest, and then that Product by the Number of Days, which reserve for a Dividend, (which divide by 365,00 the common divisor for all Rates, the Days of the Year multiplied by 100) answers the Question.

Example 5.

What's the Interest of 240*l.* for 96 Days, at 5 per Cent per Annum.

$$\begin{array}{r} 5 \\ \hline 1200 \\ 96 \\ \hline \end{array}$$

365,00,1152,00 Answ *l.* 3 3 $1\frac{1}{2}$

Likewise

212 Of FRACTIONS, &c. Chap. 19.

Likewise there may be found Decimal Numbers correspondent to the Duty or Custom on Tobacco, Holland Cloth, viz.

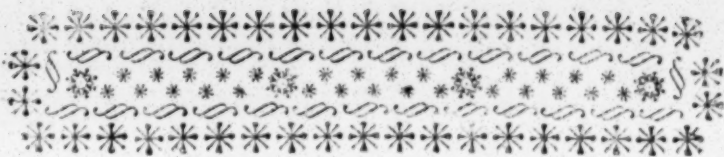
	240lb.		
	—	Old Subsidy	,95
1d. per lb.	1lb.	New Subsidy	,92625
5 per Cent. cut off	,05	Addit. Duty	,87875
	—	$\frac{1}{3}$ New Subsidy	,29485625
Old Subsidy	,25	Impost	2.484
2 $\frac{1}{4}$ per Cent off	,02375		—
New Subsidy	,92625	Duty of } 240l.	5,53385623
5 per Cent. more off } the Old, viz. 7d. $\frac{1}{2}$.	,0475		
Additional Duty	,87875		
	—		
$\frac{2}{3}$ of the New Sub-	} ,30875		
sidy with 4p. Ct. off.			
			,01389375
			—
			,29485625
	3d. per lb.	3,0	
	10 per Ct. off	,3	
		—	
		2,7	
	3 per Ct. off	,216	
		—	
		Impost	2,484
			—

And so for Holland Cloth.

So some of the Rules of Practice may be work'd by Decimals, but shorter by Vulgar Fractions.

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F I N I S.



THE

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